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INTELLIGENCE REPORT

PROSPECTS FOR SOVIET AGRICULTURE IN 1970

DIRECTORATE OF INTELLIGENCE
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~~CONFIDENTIAL~~

WARNING

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FOREWORD

The lack of progress in Soviet agriculture during the past 5 years has had a negative effect on Soviet economic growth, particularly in 1962 and 1963. With an increasing population the deterioration in the food supply has been a source of considerable popular discontent in the USSR. Soviet prestige suffered a sharp setback in 1963, when the USSR was forced to purchase grain from the West, a move that produced a shock to Soviet vanity as well as a drain on Soviet reserves of gold and foreign exchange.

In its efforts to find a solution to its agricultural problems, the Soviet leadership adopted in December 1963 a program calling for a vast increase in production of agricultural chemicals by 1970 and for major expansion in the fields of irrigation and agricultural mechanization. This report provides estimates of the extent of implementation or probable achievements of this program by 1970, attempts to measure the impact of these achievements on agricultural production, and analyzes the implications of the estimated future level of output.

The analysis contained in this report was made primarily during the period April-August 1964 -- that is, before the dismissal in October 1964 of Nikita Khrushchev and his replacement by Leonid Brezhnev as First Secretary of the Central Committee of the Communist Party of the USSR and by Alexey Kosygin as Chairman of the Council of Ministers of the USSR. To date, the impact on the Soviet agricultural program of this change in Soviet leadership, which coincidentally followed a bumper crop growing season, is not known.

Unless otherwise indicated, the statistics contained in this report were obtained or derived from data in the following basic Soviet statistical publications: Narodnoye khozyaystvo SSSR v 1962 godu (National Economy of the USSR in 1962), Moscow, 1963, and previous yearbooks of the same general title; Sel'skoye khozyaystvo SSSR (Agriculture in the USSR), Moscow, 1960; Posevnyye ploshchadi SSSR (Sown Areas of the USSR), Moscow, 1957; Zhivotnovodstvo SSSR (Animal Husbandry in the USSR), Moscow, 1959; Vneshnyaya torgovlya SSSR za 1962 god (Foreign Trade of the USSR in 1962), Moscow, 1963, and previous yearbooks of the same general title; V.P. Zotov, Pishchevaya promyshlennost' Sovetskogo Soyuza (Food Industry of the Soviet Union), Moscow, 1958; Kapital'noye stroitel'stvo v SSSR (Capital Construction in the USSR), Moscow, 1961; and SSSR v tsifrakh v 1963 godu (The USSR in Figures in 1963), Moscow, 1964. In some cases these statistics, along with the estimates, have been rounded. For this reason, the components in some tables may not add to the totals shown.

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PROSPECTS FOR SOVIET AGRICULTURE IN 1970*

Summary and Conclusions

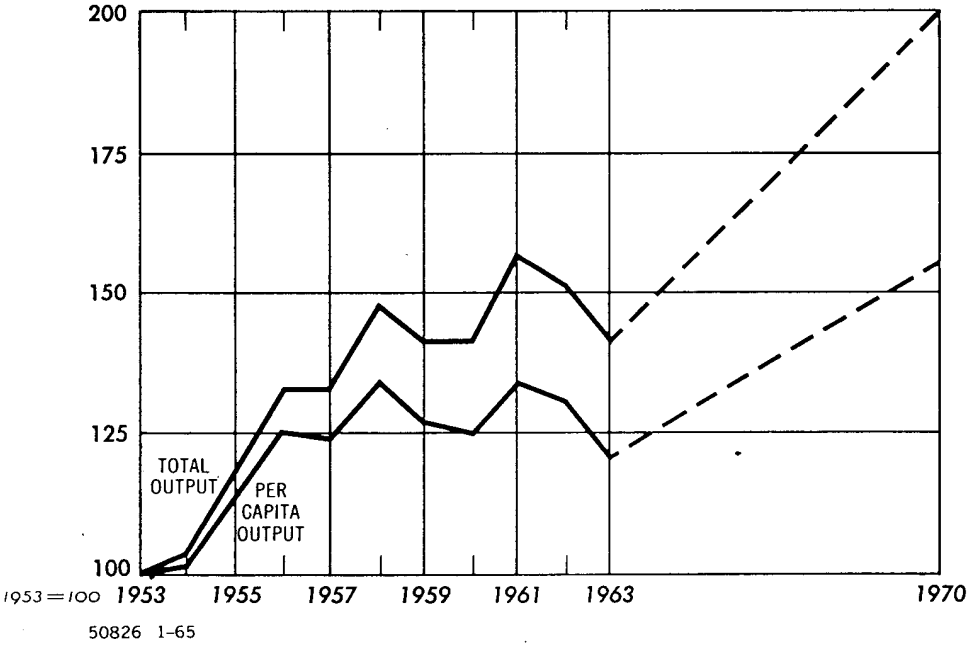
Net agricultural production in the USSR by 1970 is expected to be somewhat more than one-third above the average level of 1958-63** if the emphasis on agriculture as generally laid down by Khrushchev is continued throughout the period. The projected increase implies an average annual rate of growth of about 4-1/2 to 5 percent during 1964-70. As indicated in Figure 1, this relatively high rate of growth is projected from the low 1963 base (caused by very unfavorable weather) and is well

Figure 1

USSR

TOTAL AND PER CAPITA NET AGRICULTURAL OUTPUT

SELECTED YEARS, 1953-70



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* The estimates and conclusions in this report represent the best judgment of this Office as of 1 January 1965.

** This estimate assumes average weather and the use of 40 million tons of chemical fertilizer on crops by 1970. Better or worse than average weather conditions could swing net agricultural output 10 percent in either direction. An increase in the utilization of fertilizer of 15 to 20 percent to 47 million tons, with average weather, would provide an additional increase in net agricultural output of only about 5 percent. (Tonnages are given in metric tons throughout this report.)

below the annual rate of growth of 8 percent achieved during 1954-58. Furthermore, there will be 20 million more Soviet citizens to feed and clothe by 1970, if the rate of population increase estimated by the US Bureau of the Census is projected, and net agricultural output per capita will be about 20 percent above the average level of 1958-63 but only about 15 percent above the level of 1958. Thus, although agricultural output in 1970 will be well above that in recent years, the Soviet agricultural problem will not be solved, and performance in this sector will be disappointing in relation to the overly ambitious goals.

Increased supplies of agricultural commodities in the USSR by 1970 will provide an improved level of consumption, modest additions to state reserves, and supplementary means of payment for imports of chemical and other industrial equipment and plants. Per capita consumption of high-protein foods will fall far short of the levels promised by Soviet leaders, however, and dietary improvement is not expected to have a marked effect upon worker productivity. The US may face significant competition from the USSR in the export of wheat, cotton, and oilseeds to the hard currency market as the USSR seeks to improve its foreign exchange position. Exports of agricultural products to the European Satellites and to the less developed countries of the Free World are not expected to increase significantly except when politically motivated, and then increased exports will be at the expense of domestic consumption and/or hard currency earnings.

Although the USSR now has a substantially larger economic base on which to generate agricultural growth than it had in 1953, costs of additional agricultural output will be much higher than in the past decade because the factors that produced relatively cheap gains in the past have been largely used up. Expansion in the dry "new lands" farming area has reached its limit, and future gains through acreage expansion must be achieved by the slow and expensive process of land reclamation through irrigation and drainage. The replacement of draft animals with mechanical draft power -- which released substantial amounts of feed for production of additional livestock products in the past -- has largely been completed. Procurement price levels are beginning to press against retail price levels, and future agricultural incentives will have to be more closely linked to increases in labor productivity -- no easy task, judging from past performance. Furthermore, because of the large increases in procurement prices and the extensive conversion of collective farms to state farms over the past decade, a large part of the investment load has been shifted from the peasant to the state, which now must bear a larger share of the increased financial burden of the current program.

As opposed to the factors that will generate growth, certain legacies probably will inhibit agricultural growth in the USSR in the future. The present Party-dominated system of agricultural administration, for example, appears to be less geared to the needs of the

complicated intensification program than it was to the needs of the previous extensive and straightforward "new lands" and corn programs, and political interference in farm management may lead to a greater waste of resources than in the past. This shortcoming probably will not be offset by improvements in the quality of the agricultural labor force, now heavily weighted with old and unskilled workers. Finally, although for the purposes of this report it was necessary to assume that Soviet agriculture will continue to enjoy its present high position in the scale of national priorities,* realistically the duration of this priority will depend on the size of the harvests, changes in leadership, the international situation, and other factors the incidence of which cannot be predicted.

Statements by the new leadership since the dismissal of Khrushchev in October 1964 do not indicate a reduction in the priority of agriculture sufficient to alter significantly the conclusions of this report. On the contrary, a continuation of a relatively high priority for agriculture is indicated. Premier Kosygin in his speech to the Supreme Soviet in December 1964 described the development of agriculture as "a task of paramount importance" and reported that the draft of the new Five Year Plan (1966-70) provides for investments and measures designed to overcome completely the lag in agricultural production within the next 5 years. Nevertheless, as indicated in the analysis in this report, Khrushchev's goals for chemical fertilizers and irrigation are expected to be scaled down or greatly underfulfilled -- that is, by 1970 only about two-thirds of the amount of chemical fertilizers called for by Khrushchev is expected to be utilized effectively in agriculture, and only about one-half of his goal for expansion of the irrigated area is expected to be realized.

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* For a list of assumptions that provide the frame of reference for projecting growth through 1970, see VI, p. 67, below.

I. Agricultural Resource Base

The USSR has a total area of 2,240 million hectares* compared with 936 million hectares 1/** in the US. However, the USSR does not have a large agricultural base relative to the tremendous size of its land mass. The factors of climatic continentality impose rather severe limitations on the area base of agriculture. In 1962 a total of 609 million hectares in the USSR was classified as agricultural land,*** 236 million hectares of which were arable.† These data are to be compared with 541 million and 159 million hectares, respectively, in the US for 1959. 2/ Thus the USSR, with almost 2.4 times as large a land area, has only about one-eighth more agricultural land and only a 50-percent larger arable area than the US. However, the USSR, which has nothing corresponding to the most productive agricultural regions of the US, has been expanding its sown acreage in an attempt to meet agricultural production needs, while an overabundance of agricultural production in the US has prompted a policy of reducing the acreage under cultivation. Consequently, the sown acreage in the USSR, amounting to 216 million hectares in 1962, exceeded the 122 million hectares seeded in the US 3/ by 77 percent.

The basic environmental restrictions in Soviet agriculture are low temperature in the north and aridity in the south. The climatic impingement in the USSR increases eastward, forcing a gradual reduction in the width of the cultivated area. The valuable "middle ground," or "fertile triangle," of Soviet agriculture extends from a relatively narrow base between Leningrad and Odessa in the west to an apex somewhat east of Krasnoyarsk. The area of greatest agricultural activity in the USSR is found in a latitude comparable to areas in the Western Hemisphere north of Ottawa, Ontario, and Minneapolis, Minnesota.

The short growing season and the extremes of temperature limit the types of crops that can be grown in the USSR. Krasnodar in the fertile North Caucasus has a frost-free period of 190 days, comparable to Omaha, Nebraska, and Khar'kov in the Ukraine has only 150 frost-free days, similar to southern Minnesota, while at Moscow a frost-free season of 130 days corresponds to conditions in parts of North Dakota. Stations of corresponding latitudes farther eastward in the USSR have even shorter growing seasons. 4/ The short growing season restricts the growing of spring-sown crops, whereas the extremely low temperatures in winter severely restrict the areas in which fall-sown and perennial crops can be grown. During severe winters, extensive winterkill of fall-sown grains is experienced even in southern regions of the USSR, where winter wheat predominates.

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* One hectare equals 2.471 acres.

** For serially numbered source references, see Appendix C.

*** Agricultural land includes primarily arable and pasture land.

† Arable land includes land that is or has been under cultivation.

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Low potential evapotranspiration* and poor drainage in the cool northern regions have resulted in the extensive development of overmoist lands in spite of the relatively low average annual rainfall in these areas. For example, in the Kaliningrad area, the region of greatest potential drainage-reclamation, the average annual rainfall is less than 25 inches. The excess of precipitation over potential evapotranspiration in much of the western and northwestern USSR is less than 5 inches. However, this small excess of precipitation, combined with the lack of dominant drainage patterns in the formerly glaciated areas, has resulted in the extensive development of overmoist lands. Approximately 10 million hectares of swamp and bog lands reportedly have been drained, but at present fewer than 3 million hectares are being fully utilized for crop production.** One Soviet source estimates that the area of feasible drainage-reclamation is about 18 million hectares, 6/ a figure that includes only swamps, which generally are in areas of less extreme temperatures and thus are believed to be suitable for crop production.

A deficiency in moisture is a handicap to agricultural production in the USSR equally as important as the long and severe winters and the excess moisture in certain areas. The southern boundary of the "fertile triangle" is determined in large part by aridity. Crop production generally is not economically feasible without irrigation in the areas south of this boundary. In the most arid lands of Soviet Central Asia, only 3 to 6 inches of precipitation fall annually, while the potential evapotranspiration ranges from 35 to 55 inches. 7/ Even within the "fertile triangle," most of the southern and eastern agricultural regions are in the semiarid zone. In this zone, not only is the annual precipitation light, but also it varies greatly from year to year, and its seasonal distribution is often unfavorable to crops. Spring wheat, which accounts for about three-fourths of the total wheat acreage, is grown largely in this zone. The late spring and early summer droughts that are frequent in these areas are often accompanied by scorching dry winds, the so-called sukhovey. Crop failure in the semiarid zone can be expected in 1 year out of every 4 or 5.

The continental influence, largely responsible for excessive moisture in the higher latitudes, tends to increase the aridity of the southern USSR. Great distances from large water sources, combined with the barrier of surrounding mountains, act to reduce the moisture received in the interior. The desert lands of the USSR are in the latitudes of the prevailing westerly winds that normally carry cyclonic and other storm activity, but by the time these storms travel more than 1,000 miles inland to the southern regions of the USSR, little moisture remains to be precipitated. Also, a minimum of precipitation falls during the hottest season of the year, intensifying the adverse effect of drought on vegetation and crops.

* Evapotranspiration is the loss of water from the soil by evaporation and by transpiration through plants.

** Estimate based on information in source 5/.

The "new lands" program, which was largely implemented during 1954-56, resulted in a one-fourth expansion in the sown acreage of the USSR and significantly altered land use patterns. Under this program, about 42 million hectares of virgin and long-fallow land* were brought under cultivation, largely in West Siberia and North Kazakhstan. This program brought under cultivation substantial acreages that appear to lie somewhat beyond the northern boundary of the "fertile triangle" in West Siberia and its southern boundary in Kazakhstan. Some of the land that has been taken under the plow since 1954 receives less than 12 inches of precipitation annually and is of marginal value for crop production. The continuous cropping of the land, primarily to spring wheat, for some 8 to 10 years has resulted in a decline in its productivity owing to a sharp increase in weed infestation, the lowering of the native fertility of the soil, and the problem of wind erosion. However, with proper management, output of grain from the "new lands" probably could be maintained at an economically profitable level and could account for about one-tenth of the total production of grain in the USSR.

* Long-fallow land, according to the Soviet definition, is land that has not been used for 2 years or more.

II. Inputs, 1953-63

A. Labor and Incentives

1. Rural Population

Between 1953 and 1963 an average of 1.5 million to 2.0 million rural residents in the USSR moved annually to urban areas. The extent of this migration was about equal to the natural increase of the population in rural areas, and, as a result, the size of the rural population -- 108 million -- was about the same in 1963 as in 1953 (see Table 1).

Table 1

Population of the USSR, Rural and Urban a/
1953-63

Million Persons

Year	Total	Rural	Urban
1953	189.5	107.6	81.9
1954	192.7	107.7	85.0
1955	196.1	108.9	87.2
1956	199.6	109.8	89.8
1957	203.1	109.6	93.5
1958	206.8	109.0	97.8
1959	210.5	108.6	101.9
1960	214.2	108.1	106.1
1961	217.9	107.8	110.1
1962	221.4	107.9	113.5
1963	224.7	107.8	116.8

a. Midyear data. Official estimates of the total population have been adjusted slightly to agree with the estimates prepared by the Foreign Demographic Analysis Division of the US Bureau of the Census.

Although the size of the rural population remained relatively stable for 1953-63 as a whole, it varied during the period in response to changes in the economic position of the rural population relative to the urban population and to changes in the regime's programs for agriculture. The improvements in rural living conditions after 1953, coupled with the "new lands" labor recruitment program, temporarily may have slowed rural-to-urban migration and may have resulted in an actual increase in the rural population. After 1956, however, the rural population declined as migration accelerated, apparently because the per

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capita increase in real incomes of the Soviet farmers during 1957-61 relative to that of workers and employees was less favorable than during 1951-56. During 1961-63 the rural population remained relatively stable in size.

In 1961 the size of the urban population of the USSR for the first time exceeded that of the rural population. Between 1953 and 1963 the increase of 34.5 million, or 42 percent, in the urban population absorbed practically the entire increase in the total population.

The migration from rural to urban areas has consisted largely of persons in the key working ages of 20 through 44 years. According to the result of the 1959 census of population, as shown in Table 30,* only 47 percent of all persons in those ages live in rural areas, whereas 55 percent of both younger and older persons live in those areas.

2. Size of the Agricultural Labor Force

The agricultural labor force of the USSR as a proportion of the total civilian labor force declined from 55 percent in 1953 to 44 percent in 1963 (see Table 2). Although the agricultural labor

Table 2

Civilian Labor Force of the USSR,
Agricultural and Nonagricultural a/
1953 and 1955-63

Million Persons

Year	Total	Agricultural	Nonagricultural
1953	92.5	50.5	42.0
1955	95.6	51.1	44.5
1956	98.9	52.8	46.1
1957	100.6	52.6	48.0
1958	102.4	52.4	50.0
1959	103.5	51.3	52.2
1960	106.1	51.2	54.9
1961	108.0	49.9	58.1
1962	109.5	49.4	60.1
1963	111.5	49.4	62.1

a. 8/. Estimated midyear data.

* Appendix A, p. 97, below.

force in 1963 was only slightly below its size 10 years earlier, it dropped by 6 percent compared with the average level of 1956-58. Variations in agricultural employment during the period generally paralleled the variations in the rural population. In 1962, however, agricultural employment continued to decline, although the rural population actually increased slightly. This discrepancy reflects increasing employment of rural residents in nonagricultural activities. In 1963, agricultural employment remained at the level of 1962.

The decline in agricultural employment since 1960, although small, is not consistent with the goals of the Twenty Year Plan (1961-80), which called for identical increases in both output and productivity at farms during the 1960's with no change in the size of the farm labor force. (A large drop in the agricultural labor force, however, will take place during the 1970's if planned output and productivity goals for 1980 are fulfilled.) The recent decline in farm employment, coinciding with the stagnation of agricultural production, leaves the Soviet planners with a difficult choice in allocating manpower resources. The workers who were lured to the city and thus left the farms apparently were needed to meet plan goals in the nonagricultural sector of the economy. Any improvement in material incentives for farm workers might slow down or even halt the continuing decline in farm employment. In that event, the additional labor requirements of the nonagricultural sector, which are expected to exceed the growth of the urban labor supply during the 1960's, would not be met.

3. Distribution of the Labor Force, by Place of Employment

In spite of the conversion of many collective farms (kolkhozes) into state farms (sovkhozes) since 1956, the collective farms continue to employ (or underemploy) the dominant share of the agricultural labor force. In 1963 the labor force at collective farms numbered 36.7 million persons -- about 74 percent of the total farm labor force compared with 85 percent in 1953 (see Table 3*).

The estimates of the labor force at collective farms shown in Table 3 represent the number of persons who worked at such farms at any time during the year. They include not only persons who worked in the collectivized activities of the farms but also those who worked exclusively in the private subsidiary economy -- the so-called "private plots." Moreover, the estimates include persons who were engaged in nonagricultural activities at those farms -- such as the repair of farm machinery -- as well as those engaged in agricultural activities. The estimates of employment at machine tractor stations** and at state agricultural enterprises, as shown in Table 3, represent annual averages, and the estimates of private subsidiary agriculture (except at collective farms) represent equivalent man-years.

* P. 12, below.

** Machine tractor stations (MTS's) in 1958, repair technical stations (RTS's) thereafter.

Table 3

Agricultural Labor Force of the USSR, by Major Sector a/
1953 and 1955-63

Million Persons

Year	Total	Collective Farms (Including Private Subsidiary Agriculture)	Machine Tractor Stations (or Repair Technical Stations After 1958)	State Agricultural Enterprises	Private Subsidiary Agriculture (Except at Collective Farms)
1953	50.5	43.1	1.1	2.9	3.4
1955	51.1	41.6	3.1	3.1	3.3
1956	52.8	43.3	2.9	3.3	3.3
1957	52.6	42.4	2.6	4.2	3.4
1958	52.4	42.6	1.2	5.0	3.6
1959	51.3	42.1	0.5	5.3	3.4
1960	51.2	40.2	0.3	6.8	3.9
1961	49.9	37.9		7.8	4.2
1962	49.4	36.9		8.2	4.3
1963	49.4	36.7		8.4	4.3

a. Based on source 9/. Estimated midyear data.

The resulting hybrid estimates of the agricultural labor force are intended to illustrate the size of the manpower pool at Soviet farms rather than the actual input of labor into agriculture. They represent an approximation of the number of persons who live on farms and are economically active and who theoretically would be available for transfer to the industrial sector of the economy when no longer needed in agriculture.

4. Quality of the Agricultural Labor Force

Although in 1959 more than one-half of the total population of the USSR lived in rural areas, only 25 percent of all high school graduates and 16 percent of all college graduates were living in those areas. The average educational attainment of farm workers in 1959 was only 4-1/2 years compared with 5-1/2 years for urban workers.

Intensive efforts to increase sharply the number of professional personnel at Soviet farms have been only partly successful. In 1962 about 416,000 "specialists" -- that is, graduates of secondary specialized and higher educational institutions -- were employed in Soviet agriculture (see Table 31*). They constituted only 4 percent of all specialists employed in the economy as a whole and less than 1 percent of the agricultural labor force.

About 306,000, or three-fourths, of the specialists employed in agriculture in 1962 were agronomists, zootechnicians, and veterinarians, and the remainder were engineers, technicians, and persons who had majored in some other nonfarm field of study. The agronomists, zootechnicians, and veterinarians working at farms constituted less than half of all such specialists employed in the civilian economy in 1962, and about 359,000 persons trained specifically for those fields were employed in various nonagricultural branches, probably concentrated in government offices.

As shown in Table 31, the proportion of farm specialists actually employed at farms was as low as 31 percent in 1953 (96,000 out of 312,000). At that time, most of the specialists who were not employed at farms were working in government offices, although many of them were transferred subsequently to MTS's. By 1957, about 281,000, or 60 percent of all agricultural specialists, were employed at farms, but the breakup of the MTS's in 1958 reversed the upward trend in that percentage.

In an effort to maintain an adequate staff of specialists at farms and to reduce the turnover among them, it was decreed in April 1962 that such specialists no longer could quit their farm jobs voluntarily. According to the decree the permission of the regional

* Appendix A, p. 98, below.

production administration was required before a specialist could be released from his job at a collective farm. This limitation on mobility, however, may have aggravated the situation by inducing recent graduates of agricultural schools, as well as those currently working off the farms, to shun the farms in favor of factories and government offices, where such limitations on mobility do not exist.

The USSR in recent years has experienced a similar problem with the hundreds of thousands of skilled workers who have been trained at government expense in "agricultural-mechanization schools." Because of the generally higher pay and other advantages of urban areas, these skilled workers also have abandoned the farms in large numbers and applied their skills in more lucrative fields. The number of agricultural machine operators trained in vocational schools and at farms during 1958-62, for example, was about 2.6 million. The total number of such operators employed at farms, however, increased by only 332,000 between 1957 and 1962 -- from 2.33 million to 2.66 million.

5. Prices and Wages

Money incentives were prominent among the measures taken to improve the agricultural situation following the death of Stalin. Procurement prices, which had been intolerably low for most agricultural products, were raised sharply; tax concessions were made; and obligatory deliveries from private plots were decreased and then abolished. However, additional stimuli necessary to overcome the inertia in the agricultural economy were lacking during 1959-61.

There is little evidence to indicate that the reform of the procurement price system in 1958 took into consideration the full financial effects of the abolition of the MTS on the collective farms. Following the mediocre crop years 1959-61, the heavy financial burden that was imposed on the collective farms by the purchase of machinery from the MTS had become obvious. The increase in gross money income of the collective farms (as calculated in terms of current rubles per household) averaged only 6 percent annually for these 3 years, while the expenses of the farms had greatly increased. In contrast, during 1954-58, money income per household on collective farms increased an average of 23 percent annually.*

Early in 1961 the regime began to take measures to improve the financial condition of the collective farms. A decree of 10 January 1961 provided for an extension of the period over which the farms could pay for the machinery purchased from the MTS's; for a decrease in the prices of equipment, gasoline, and building materials; for a reduction of 80 percent in the tax on income from animal husbandry through 1965;

* Peasant income per capita, which increased an average of more than 7 percent annually during 1954-58, increased less than 3 percent annually during 1959-61 (see Table 4).

Table 4

Income of Collective Farms and Peasant Income in the USSR
1953-63

Year	Gross Money Income of Collective Farms a/ (Rubles per Household)	Index of Peasant Income Per Capita b/ (1953 = 100)
1953	252	100
1954	321	N.A.
1955	382	116
1956	476	126
1957	505	133
1958	702	142
1959	742	145
1960	781	147
1961	830	154
1962	938	N.A.
1963	993	N.A.

a. New rubles expressed in current prices, including income from commodities produced by the collective farm (excluding private plots) and sold either to procurement organizations or in collective farm markets. This income must cover monetary labor payments, other current operating costs, and the bulk of investment outlays.
b. Based on 1955 prices, including both money and in-kind income received by the peasant in the form of labor payments from the collective farm and from the sale of products produced on the peasant's private plot as well as money income from pensions, subsidies, and stipends and an allowance for the value of state expenditures on cultural and medical institutions.

for a decrease in the interest rate on long-term state credits; and for the assumption by the state of the transportation costs for delivering the products of the collective farms to procurement points. These measures were expected to save the collective farms about 1.35 billion rubles annually.*

One of the most important measures taken since 1958 to stimulate the agricultural sector, especially in animal husbandry,

* Ruble values in this report are given in new rubles. A nominal rate of exchange based on the gold content of the respective currencies is 0.90 ruble to US $1. This rate should not be interpreted as an estimate of the equivalent dollar value of similar US goods or services.

was the decree of 1 June 1962 that raised the procurement prices for livestock and poultry obtained from collective farms and individuals an average of 35 percent and the procurement prices for butter and cream by 10 percent and 5 percent, respectively. Procurement prices for milk and eggs also were raised by pegging the year-round prices for these products at the high winter price schedule.* 11/ The new prices for livestock products were expected to increase the money income of the collective farms by about 1.2 billion rubles annually. Because the new prices were not effective until 1 June, they increased the money income of collective farms in 1962 by only 0.74 billion rubles. Money income from all sources of the collective farms increased by 1.67 billion rubles, or 12 percent, in 1962 (13 percent per household).**

State purchase prices for cotton, sugar beets, and potatoes were raised significantly in 1963, but the benefits derived from these increases were largely offset by the effects of the generally harsh growing conditions throughout 1963. 12/ The money income of collective farms increased only 0.86 billion rubles, or 6 percent, in 1963 (also 6 percent per household).

Yields of cotton respond to changes in procurement prices for the following reasons: (a) cotton is grown entirely under irrigation in the USSR, (b) it enjoys a high priority in the allocation of fertilizers and other inputs, and (c) all of the crop is purchased by the state. During 1958-62, wages on the collective farms that grew cotton failed to increase and on some farms declined. Yields of cotton per hectare dropped steadily from 1959 to 1962. In March 1963 the state purchase price for cotton was raised 20 percent for collective farms and 12 percent for state farms. 13/ The price increase of 1963 apparently produced the desired effect -- early plantings of cotton that suffered damage from weather were replanted promptly, net acreage was expanded, and above-average yields produced a record cotton crop.

Unlike cotton, almost all of the sugar beets and potatoes in the USSR are grown outside the irrigated area, and yield levels have been largely a function of weather. In addition, only a small share of the potato crop is purchased by the state, and state procurement prices have little effect on the money income and incentive of the potato grower. Thus, although state purchase prices were raised 18 percent for sugar beets and about 50 percent for potatoes in the fall of 1963, adverse growing conditions reduced the harvest of these crops below the average level of recent years.

The increase in procurement prices for livestock products in June 1962 was passed on to the consumer, who was assured by the

* The price paid for grain procured from collective farms also was raised slightly in 1962. 10/

** The USSR has not published statistics on peasant income per capita for 1962 and 1963.

regime that both procurement and retail prices would be lowered as soon as costs could be reduced in the livestock industry. This will be no easy task, judging from past performance -- during the 5 years 1958-62, unit production costs on the collective farms were lowered only 2.3 percent per year for pork and eggs, 1.6 percent for beef and veal, 1 percent for wool, and less than 1 percent for mutton and milk. Even these modest achievements are more apparent than real -- in 1960 and 1961, large numbers of unprofitable collective farms were converted to state farms, thus raising the average level of productivity in the collective sector.

Conversion of collective farms to state farms as a means of eliminating unprofitable collective farms was halted in 1962, and early in 1964 the leadership adopted a new method of aiding economically weak collective farms. This aid is to be rendered by an expansion of the long-term credit program to stimulate farm construction and mechanization and by the direct state subsidy of 85 percent of the costs of the weak collective farms in the liming of acid soil, the construction of drainage systems, and the extraction and application of peat. In addition, during 1964-66 the weak collective farms will be granted a reduction of 75 percent of their calculated income tax. These measures are expected to stimulate higher rates of pay and investment in the weak collective farms. 14/

A step toward improving the economic position of the Soviet peasant was taken in July 1964, when a compulsory pension system was voted for the collective farmers. The previous optional system had been unsatisfactory because only the well-to-do farms could afford to withhold an adequate share of their incomes for pension purposes. This incentive probably will improve worker morale at collective farms and may reduce the extent of migration to urban areas. For the skilled younger workers, however, the lure of the city is not likely to be diminished by the promise of a pension in old age. These young workers, usually with mechanical ability and training, are needed desperately at the farms if efficiency in agriculture is to be improved.

B. Investment

1. Priority of Agriculture

During the period of the "new course"* and "new lands" programs the agricultural sector enjoyed a high position in the scale of national priorities. As shown in Table 5,** productive agricultural investment increased 45 percent in 1954 and 38 percent in 1955 compared with a gain of less than 2 percent annually during 1952-53. The

* A program adopted in 1953 when Malenkov was Premier that gave relatively high priority to industries producing consumer goods.
** P. 18, below.

Table 5

Productive Capital Investment in Soviet Agriculture
1951-63

Year	Million New Rubles a/			Percent	
	By the State	By the Collective Farms	Total	Annual Increase	Agricultural Investment as a Share of Total Investment b/
1951	1,025	836	1,861		16
1952	971	962	1,933	4	15
1953	881	1,029	1,910	-1	14
1954	1,536	1,226	2,762	45	17
1955	1,992	1,812	3,804	38	20
1956	2,118	1,906	4,024	6	19
1957	2,343	1,860	4,203	4	18
1958	2,279	2,462	4,741	13	17
1959	2,021	3,050	5,071	7	16
1960	2,471	2,721	5,192	2	15
1961	2,984	2,739	5,723	10	16
1962	3,364 c/	2,960 c/	6,324	10	17
1963	4,200 d/	3,060 c/	7,260	15	18

a. Expressed in current prices.
b. Exclusive of investment in private housing.
c. Estimated.
d. 15/

share of total investment* that went into agriculture reached a peak in 1955 and 1956, and agriculture received more than 18 percent of the total investment in the economy for 1954-58.

Following 2 years of mediocre performance in the agricultural sector, Khrushchev announced in January 1961 another era of high priority for this sector. In contrast to the "new course" and "new lands" programs, however, the provision of additional financial support to agriculture initially developed as an indecisive, piecemeal process. The potato shortage in the winter of 1962-63, the failure of the wheat crop in 1963, and the impact of consumer dissatisfaction stemming from these and other shortages probably accelerated this process, and by the end of 1963 the high-priority position of agriculture appeared to be firmly established. The duration of this priority will depend on the size of the harvests, changes in leadership, the international situation, and other factors.

2. Collective Farm and State Investment

Trends in investment by the collective and state sectors in the past decade have been affected by the source of investment funds, by the conversion of collective farms to state farms, and by the MTS reform. Investment by collective farms is financed largely from the income received by the farms, which, in turn, is highly dependent on the weather, price levels, and other factors. In 1958, for example, the collective farms set aside more than 3 billion rubles in capital (to the indivisible fund) in contrast to a "plan" of 2.5 billion rubles. A combination of factors produced this sizable discrepancy. As a result of excellent weather conditions during the growing season and an increase in the level of procurement prices, the income of the collective farms rose sharply in 1958. Moreover, the percentage of the income of collective farms set aside for the indivisible fund was increased in 1958. Long-term state credits are available to the collective farms, but because the loans must be repaid, investment from these credits, at least in the long run, are also functionally dependent on savings from income. The "flexible" procurement price system, effective 1 January 1958, was advertised as a means of eliminating year-to-year fluctuations in the income of the collective farms. An examination of the Soviet procurement price index for the years 1958 (a bumper crop year) and 1959 (a mediocre crop year), however, reveals little if any flexibility.

The growth of state agriculture at the expense of collective agriculture is illustrated in Figure 2.** Large numbers of collective farms in the "new lands" were converted to state farms in 1957.

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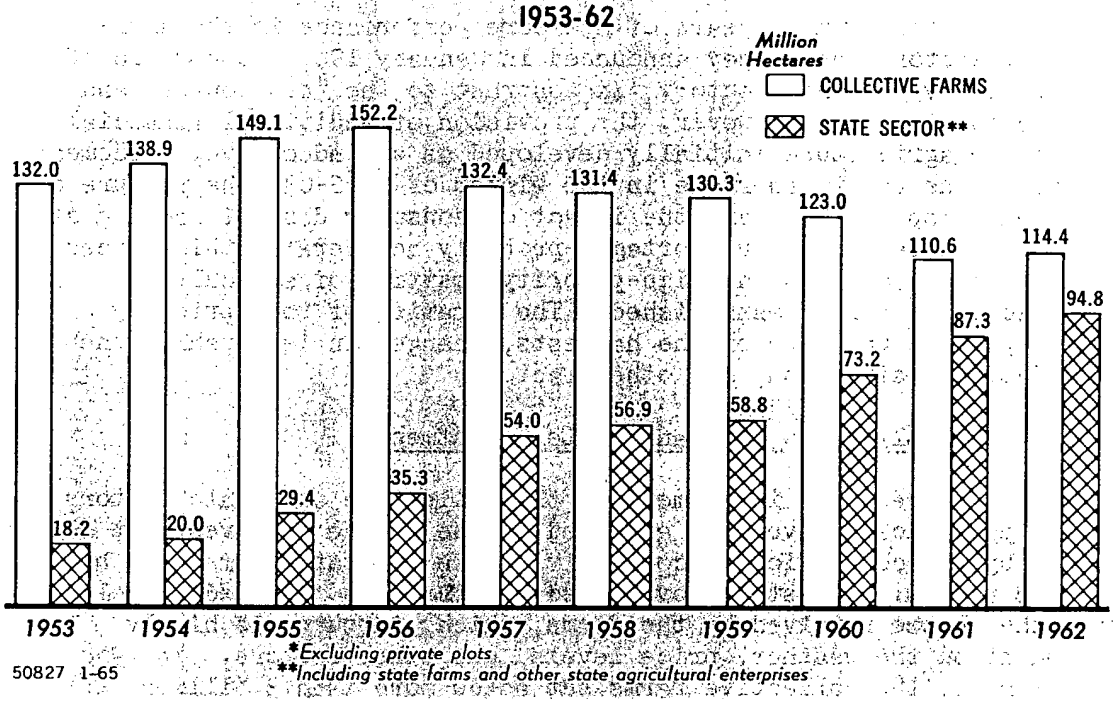
* Exclusive of investment in private housing.

** P. 20, below.

Figure 2



Although this conversion shifted the burden of future investment to the state, the collective sector had financed a large part of the "new lands" expansion, through both direct investment and payments for the services of the state MTS system. As indicated in Figure 2, during the early years (1954-56) of the "new lands" program the sown acreage in the collective sector grew more than in the state sector. The MTS reform in 1958 reversed the situation of 1957 by shifting a large investment load to the collective farms,* but conversions in 1960 and 1961 shifted the burden back to the state.

The net effect of these changes over the past decade is that the state rather than the peasant now bears a large share of the investment risk in Soviet agriculture. In 1963, almost 60 percent of the total investment was on the state side of the ledger compared with an average of 50 percent during 1951-53 (see Table 5**). The contrast is much greater, of course, than is shown by the ledger. During 1951-53 the collective farms -- with a low, unstable income

* Payments by the collective farms for MTS equipment and facilities and the cost of acquiring new equipment.
** P. 18, above.

and high, fixed charges for MTS services -- were financing indirectly a much larger share of state investment than they were in 1963.*

3. Present Levels of Mechanization

By concentrating on a limited number of objectives and by making more intensive use of available equipment, the USSR has achieved a rather high level of mechanization in certain basic field operations in agriculture. Nearly all of the plowing, seeding, cultivating, and harvesting of grain crops on collective and state farms has been done with tractor-powered or self-propelled equipment for the past several years. By contrast, only about 45 percent of the sugar beets on collective and state farms were harvested by combines in 1962, 40 percent of the flax was pulled by machine, 10 percent of the cotton was harvested by mechanical pickers, and 25 percent of the cows were milked with mechanical milkers. There was even less use of equipment in animal husbandry work in general and in the growing of potatoes, vegetables, and fruits. Nevertheless, the number of tractors available in agriculture doubled in 10 years, from 744,000 physical units at the beginning of 1954 to 1.45 million at the beginning of 1964. During this decade the total sown acreage per tractor (in terms of 15 horsepower units) decreased from 127 hectares to 84 hectares, and the acreage of grain and sunflowers per grain combine decreased from 348 hectares to 259 hectares. Inventories of other major types of equipment in agriculture also have increased substantially, as shown in Table 6.**

The priority for resources for Soviet agriculture as reflected in deliveries of equipment has not been consistent in the past 10 years, as shown in Table 32.*** A period of relatively high priority for agriculture during the height of the "new lands" program (1954-57) was followed by a period (1958-60) of decreasing production of agricultural machinery and a drop in the share of tractors and trucks allocated to agriculture from new production. Problems of falling inventories and serious shortages of equipment prompted a redirection of attention to agriculture, reflected in an upward trend in deliveries that began in 1961 and has continued to the present. Production of agricultural machinery in 1963 was about 35 percent greater than in 1957 and about double the low in 1959. Although the share of the tractors produced in 1963 that was delivered to agriculture was no greater than the 73 percent delivered in 1957 and less than the share delivered in 1955 and 1956, the actual number of tractors delivered to agriculture in 1963 exceeded deliveries in 1957 by 61 percent. Deliveries of trucks, however, have dropped far below deliveries during the height of the "new lands"

* Developments in Soviet agricultural investment since World War II are treated in detail in source 16/.

** P. 22, below.

*** Appendix A, p. 99, below.

Table 6

Inventories of Tractors, Trucks, and Selected Major Types of Agricultural Machinery in Soviet Agriculture a/ 1954 and 1964

Thousand Units

Type of Equipment	1954	1964
Tractors	744	1,451
Trucks	424	916
Grain combines	318	533
Of which:		
Self-propelled	109	345
Ensilage combines	2.4	198
Beet combines	4	52
Potato combines	0.5	8 b/
Tractor plows	668	830 b/
Tractor cultivators	559	829 b/
Tractor drills	644	1,089 b/
Windrowers	3	305 b/

a. As of 1 January.
b. As of 1 January 1963.

program both in terms of actual units and in terms of the share of new production. As a result, Soviet agriculture at present faces serious problems of farm transport that have prompted a tendency to use older trucks beyond normal retirement age and a noticeable shift to the use of farm trailers.

Throughout the postwar period the adverse effects of shortages of equipment in the USSR have been compounded by severely inadequate supplies of spare parts, faulty distribution among users of both new machinery and spare parts, inadequate repair facilities, poor organization of farm work, and an insufficient number of qualified equipment operators.

4. Volume of Construction in Agriculture

Except for the early years of the "new lands" program (1955-56), the volume of construction in agriculture showed no signs of preference in the allocation of construction resources in the Soviet economy until 1961 (see Table 7). The year 1961 was a turning point in construction as a whole in the USSR. The total volume of

Table 7

Volume of Construction Work in Soviet Agriculture
in Productive and Nonproductive Facilities a/
1953-63

Year	State Sector		Collective Farms		Soviet Agriculture	
	Million Rubles	Share of Construction in Soviet Agriculture (Percent)	Million Rubles b/	Share of Construction in Soviet Agriculture (Percent)	Million Rubles b/	Share of Total Soviet Construction (Percent)
1953	436	34	855	66	1,291	13
1954	799	44	1,031	56	1,830	16
1955	885	38	1,460	62	2,345	18
1956	958	38	1,585	62	2,543	18
1957	1,045	40	1,575	60	2,620	16
1958	1,219	42	1,687	58	2,906	15
1959	1,373	38	2,194	62	3,567	16
1960	1,674	43	2,197	57	3,871	16
1961	2,100	49	2,164	51	4,264	17
1962	2,387	54	2,050	46	4,437	18
1963	3,100	59	2,150	41	5,250	21

a. As an investment input in agriculture, the volume of construction work measures the value (new rubles expressed in 1955 prices) of construction performed on buildings and other structures during a given period; it also includes the cost of installing production equipment in buildings but not the cost of the production equipment itself. Mobile agricultural equipment, such as tractors and trucks, also is excluded from the volume of construction-installation work. Construction of private rural housing is not included in the volume of construction in agriculture but is included in the total volume of construction in the USSR.
b. Including relatively small amounts of investment by fishing collectives.

construction in the USSR had grown at an average annual rate of 14 percent during 1954-60, but in 1961 it showed an increase of only 1 percent and recovery in 1962-63 was slow. Thus the volume of construction in Soviet agriculture rose from 16 percent in 1960 to 21 percent of total construction in 1963, and plans for 1964-65 provide for further increases in its share of construction resources.

Most of the impetus in the growth of agricultural construction has been provided by state investment, The volume of construction performed by state financing in 1963 was 7 times greater than in 1953, whereas that performed in collective farms was only 2-1/2 times greater (see Table 7*). The state sector accounted for only one-third of the volume of construction in agriculture in 1953 and almost 60 percent by 1963. At least two factors have contributed to this. Construction in collective farms has been directly dependent on the year-to-year financial resources of the collective farms themselves, and collective farms also have been subject to conversion into state farms.

In a move to reduce the uncertainties in financing of construction in collective farms, state banking organizations recently were given the right to provide long-term credits to interkolkhoz construction and transportation equipment; for the introduction of new technology; for development and expansion of construction bases; and for the construction of enterprises to produce local construction materials. 17/

Interkolkhoz contract construction organizations have assumed an increasingly important place in construction on the collective farms, as can be seen in Table 8. Granting of long-term credits to interkolkhoz construction organizations not only means that the share of work performed by them will continue to increase but also that the role of the collective farms in the extensive agricultural construction program will be more closely coordinated with state interests.

5. Agricultural Chemicals

a. Mineral Fertilizers

Production of mineral fertilizers in the USSR, on a total nutrient basis (nitrogen, phosphorus, potassium), is only about one-half of that in the US, and application of fertilizers per unit of sown area is less than one-third of that in the US. Complex, concentrated, or mixed fertilizers, used extensively in the US, are produced on a modest scale in the USSR. Furthermore, the quality of even the simple fertilizers now produced in the USSR is often unsatisfactory; the moisture content of some fertilizers is high; and the quantity of fertilizers available in granulated form is limited. In spite of the

* P. 23, above.

Table 8

Volume of Construction Work in Soviet Agriculture
Performed by Interkolkhoz Contract Construction Organizations
1956-63

Year	Million Rubles [a]	Share of the Volume of Construction-Installation Work in All Collective Farms (Percent)
1956	29	2
1957	59	4
1958	117	7
1959	243	11
1960	400	18
1961	487	23
1962	603	29
1963	751	35

a. New rubles expressed in current prices.

inadequate supply of fertilizers for Soviet agriculture, large quantities of fertilizers and fertilizer raw materials are exported. As recently as 1962, Soviet exports of fertilizers amounted to about 10 percent of total production.

Many Soviet fertilizer plants are poorly located with respect to both raw materials and markets. The average length of haul for fertilizers in 1961, for example, was 1,180 kilometers. 18/ About 50 percent of all Soviet fertilizers are produced in the RSFSR, but half of this quantity is exported to other republics. 19/ The long distances required for transportation of fertilizers and the predominance of fertilizers with a relatively high percentage of ballast result in high shipping costs. Furthermore, large losses are experienced during transport and storage, losses that reportedly amount to about 20 percent of total production. 20/ These losses are caused in large part by a shortage of packaging and warehouse facilities. Some 40 percent of all superphosphate is shipped without packaging. 21/ Warehouse capacity for fertilizers in 1962 amounted to only about 800,000 tons, far below requirements. 22/

Soviet production of chemical fertilizers rose from about 7 million tons in 1953 to almost 20 million tons in 1963, an increase of 186 percent. (Soviet production of fertilizers and the allocation to agriculture by major type are shown in Table 9* and

* P. 26, below.

Table 9

Production and Allocation to Agriculture of Chemical Fertilizers in the USSR a/ 1953-63

	Thousand Metric Tons		
Year	Production	Allocation to Agriculture	Percent to Agriculture
1953	6,978	6,570	94
1954	8,083	7,010	87
1955	9,669	8,573	89
1956	10,940	9,429	86
1957	11,777	10,436	89
1958	12,420	10,626	86
1959	12,917	11,114	86
1960	13,867	11,404	82
1961	15,315	12,073	79
1962	17,262	13,645	79
1963	19,935	15,965	80

a. Including nitrogen fertilizers expressed in terms of 20.5 percent nitrogen (N), potassium fertilizers in terms of 41.6 percent potassium oxide (K_2O), phosphate fertilizers in terms of 18.7 percent phosphorus pentoxide (P_2O_5), phosphorite meal in terms of 19 percent P_2O_5, and small amounts of boromagnesium and boron fertilizers expressed as 7.5 and 10 percent boric acid, respectively.

Table 33.*) The allocation of chemical fertilizers to agriculture increased 143 percent from 1953 to 1963, although it should be noted again that, at least in recent years, losses have accounted for about 20 percent of the fertilizer allocated to agriculture. In any case, deliveries to agriculture have risen less than total production, with trade plus industrial and military uses taking an increasing share of output. Apart from the priority of other consuming sectors of the economy, deliveries of fertilizers to agriculture unquestionably suffered because of the failure to meet production goals. Output of 12.9 million tons in 1959 was far short of a long-range goal of 16.5 million to 17.5 million tons for that year announced by Khrushchev in 1953. The Seven Year Plan (1959-65) called for production of fertilizers to increase from 12.4 million tons in 1958 to 35 million tons in 1965. In addition to the ambitious quantitative goal, major changes were planned in the product mix, emphasizing production of concentrated and complex fertilizers as a means of increasing yields and reducing

* Appendix A, p. 100, below.

the costs of transporting large quantities of ballast. Progress toward fulfillment of these goals has been unsatisfactory. The increase in production in the 5-year period 1959-63 was only about 7.5 million tons, or an average of 1.5 million tons per year. Thus, with total production just below 20 million tons in 1963 and the plan for 1964 set at 25.5 million tons, an increase of 9.5 million tons would be required in 1965 to assure fulfillment of the Seven Year Plan. Fulfillment of the goal for 1965 is improbable, but, in view of the high priority assigned to the fertilizer industry, significant increases in production can be expected in 1964-65.

b. Pesticides

The USSR has a fast growing but still relatively modest pesticide industry. Present requirements for major pesticides are said to be satisfied by only 40 to 50 percent, 23/ and the statistic probably understates actual requirements. According to a Soviet report, 15 to 20 percent of the harvest is lost because of insects, diseases, and weeds. 24/ Losses of grain and fruit crops account for two-thirds of these losses.

Production of pesticides in the USSR rose from 26,587 tons (active base) in 1958 to 64,637 tons in 1963, 25/ and a further rise to 126,000 tons is planned in 1965. 26/ By comparison, US production of organic pesticides alone amounted to 330,000 tons in 1962. In relation to plans, progress in introducing new capacities for production of pesticides has been very unsatisfactory. In 1959-61, for example, only 41 percent of the planned new capacity was actually commissioned. In addition, problems have been experienced in bringing newly commissioned plants to full capacity. Supplies of raw materials have been inadequate, and, in the case of herbicide facilities, severe problems have been encountered with respect to the corrosion of production equipment.

C. Administration

There have been at least 10 major organizational changes in Soviet agriculture in the past decade. During this period of change the administration of agriculture was shifted out of the governmental bureaucracy (the managerial-specialist class) and into the more politically reliable and responsive Party channels. On the one hand, the dominance of the Party in agricultural administration has led to a waste of resources and a stifling of local initiative. The majority of the Party officials know little of what can be accomplished on the farm, and the chief measure of their success has been their ability to meet unrealistic pledges for the delivery of farm produce to the state. In many instances these officials have advanced their careers by meeting pledges at any cost -- by misusing farm resources at their disposal or by falsifying records and achievements.

On the other hand, a responsive, militant Party apparatus probably was needed to overcome the inertia of the conservative governmental bureaucracy in implementing such bold measures as the "new lands" program, which, although wasteful, provided a vital stimulant to Soviet agriculture. The present Party-dominated system of agricultural administration, however, does not appear to be suited to the needs of the current fertilizer program. The fertilizer program is more complicated and requires a higher level of technical and managerial skills than previous agricultural programs (the "new lands," the corn, and the plow-up programs). These skills generally are lacking in the Party apparatus, and implementation of the program will suffer unless the Party develops these skills or relinquishes some of its authority to the managerial-specialist class. The first alternative is unlikely, and the second will be adopted only with great reluctance.*

* Developments in Soviet agricultural administration during the past decade are treated in detail in source 27/.

III. Agricultural Performance, 1953-63

A. Index of Net Agricultural Production

1. Total Production

Agricultural production in the USSR appears to have passed through two rather distinct phases from 1953 through 1963. Production of agricultural products increased by about one-half during the 5-year period 1954-58. This period of rapid growth was followed by a 5-year period (1959-63) during which there was relatively little change in output. The changes in agricultural production that occurred in the USSR during 1954-63 are shown in the following index (1953 = 100) of net production (see Table 50*):

Year	Index	Year	Index
1953	100	1959	141
1954	103	1960	141
1955	119	1961	154
1956	133	1962	152
1957	133	1963	144
1958	147		

The rapid increase in agricultural production in the USSR during 1954-58 was principally the result of a rapid expansion in sown acreage during the period and of good weather in 1958.** The total sown acreage increased by almost one-fourth -- from 157 million hectares in 1953 to 196 million hectares in 1958 (see Table 36***). A good harvest of grain in the Ukraine in 1955 and record crops of grain and potatoes in 1956 raised the index of production substantially for these intervening years. The excellent harvest for most crops in 1958 coupled with gains in livestock products resulted in a large increase in production.

The lack of growth in agricultural output since 1958 can be attributed primarily to weather -- that is, 1958 was an excellent crop year, whereas the succeeding years have been only average or below. Thus the expansion of 12 percent in sown acreage since 1958 to a record 218 million hectares in 1963 has not been accompanied by a corresponding increase in output.

2. Methodology and Weights Used in Computing the Index

The measure of agricultural production chosen is the sum of the price-weighted quantities of the major crops and animal products,

* Appendix B, p. 119, below.
** Other factors are discussed in II, p. 9, above.
*** Appendix A, p. 103, below.

including changes in inventories of livestock. The crops included in the calculation of the index were grain, potatoes, vegetables, cotton, sugar beets, sunflower seeds, and fiber flax. Meat, milk, wool, and eggs were the livestock products included in the calculation as well as changes in inventories or in the number of cattle, hogs, and sheep and goats. In order to avoid double-counting -- that is, to exclude those commodities used in production of other commodities and thus arrive at an estimate of net rather than gross agricultural production -- deductions were made for the amounts of grain, potatoes, and milk fed to livestock and for the amounts of grain and potatoes used as seed.*

State procurement prices of 1 July 1958 were used to weight the physical components in the index (see Table 55**). These prices were established by the Soviet leaders as base prices, from which actual procurement prices would fluctuate to guarantee a stable income to the collective farms. In spite of its shortcomings,*** the 1958 base price system appears to be the most serious recent attempt by the Soviet leaders to develop a related set of agricultural prices that would reconcile the needs of, and costs to, the state. Other recent price adjustments have been reactions to crises -- such as the price increase of 1962 in livestock products following 2 years of declining per capita production in this sector and the price increase of 1963 in potatoes following the sharp decline in production of potatoes in 1962.

Two additional sets of prices were used to test the basic index: (a) the actual average prices paid for state procurements in the good crop year of 1958 and (b) the actual average prices paid for state procurements in the poor crop year of 1963 (see Table 55). The use of these alternate price weights has little effect on the conformation of the index. Although the alternate indexes resulting from the use of these prices diverge from the basic index in some years, there is close agreement among all of the indexes in the general trend and turning points of the time series.

3. Limitations of the Index

The index presented above represents an attempt to provide a comprehensive measure of the changes during 1954-63 in net agricultural production in the USSR. Because of the many serious problems involved -- the foremost of which is the reliability of Soviet statistics -- the results must be used with caution. The index is a more reliable indicator of the changes over a period of years than of those between any 2 consecutive years. It is a more reliable indicator

* For details concerning the methodology used in computing the index of net agricultural production, see Tables 50 through 65 (Appendix B, pp. 119 through 136, below).

** Appendix B, p. 124, below.

*** See II, A, 5, p. 14, above.

of the direction of change than of the precise amount of change. The computation of such an index involves problems of three main types: (a) incomplete coverage of the commodities, (b) possible errors in the estimates of the gross and net production of the various commodities, and (c) the choice of a system of weights for aggregating the commodities. This index includes all the major agricultural commodities produced in the USSR, so that the limitation of coverage is not believed to be serious.

Errors in the estimates of the gross and net production of the commodities in some cases, however, may be quite large. This situation is particularly true for grain, which is a storable commodity. After seed, net exports, industrial use, and waste are deducted from production of grain, there remains a large residual that must be divided somewhat arbitrarily into the categories of food, feed, and changes in stocks. Estimates of the use of grain for food were developed as residuals in the food availability balance,* and judgments were made concerning net changes in stocks, leaving feed as a residual in the grain balance (see Table 52**). These feed residuals when checked against estimates of feed requirements appeared to be of reasonable magnitude.

The value of changes in inventory of livestock is estimated by means of changes in the number of livestock and does not take into account changes in weight and quality of livestock.***

B. Production of Major Crops

Much of the increase in production of crops that occurred during 1954-63 in the USSR is attributable to the expansion in the sown acreage. This expansion was greatest during the 3-year period 1954-56, when the "new lands" were being plowed. The largest increases in acreage were in grain and forage crops (including sown grasses, corn for silage and green feed, and sugar beets for feed). Most of the expansion in sown acreage since 1958 is attributable to a reduction in the amount of land left in clean fallow (see Table 35†).

Soviet claims for production of grain in 1953-63 are given below (in million tons, including the grain equivalent of ensiled immature ears of corn), along with estimates for these years:

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* See E, p. 44, below.

** Appendix B, p. 121, below.

*** For a discussion of the method of estimating the value of the change in inventories of livestock for 1963, an unusual year, see Table 60, footnote b (Appendix B, p. 130, below).

† Appendix A, p. 102, below.

Year	Soviet Claims	Estimates
1953	82	82
1954	86	86
1955	107	107
1956	128	115
1957	105	105
1958	141	125
1959	126	100
1960	134	100
1961	138	115
1962	148	115
1963	N.A.	95

Based on reports on crop conditions, weather information, and grain acreage data, the Soviet claims for production of grain for 1950-57 (published since December 1958) appear to be fairly reliable. There is reason to believe, however, that the Soviet statistics for the late Stalin years contain a politically motivated downward bias in order to show significant improvement in production of grain during the post-Stalin or Khrushchevian years. This bias, except perhaps for 1949, is believed to be relatively small. For 1956 the difference between the claim and the estimate represents an adjustment for extraordinary post-harvest losses in the "new lands" caused by an acute shortage of facilities to store and transport the bumper crop. Beginning in 1958, Soviet statistics on production of grain appear to be highly inflated.

The "new lands" program, launched in 1954, has contributed significantly to the growth of Soviet agriculture. Production of grain from the "new lands" is estimated to have averaged 15 million tons annually, or about 14 percent of the total Soviet production of grain during 1954-63. The size of the harvest varies sharply in the "new lands," especially in Kazakh SSR, because of the extreme fluctuations from year to year in the amount and distribution of rainfall. Nevertheless, the "new lands" have provided a hedge against national crop failure because poor crop prospects in the traditional grain area of the European USSR frequently are offset by favorable prospects in the "new lands" and vice versa. This situation was especially true in 1956, when the bumper crop produced in the "new lands" offset the poor grain crop produced in other areas, and the reverse was true in 1955. Estimates of acreage, yield, and production of grain in the "new lands" and their contribution to the total Soviet production of grain are shown in Table 10.

Production of wheat in the "new lands" relieved the pressure on the traditional agricultural areas for production of food grains and permitted the expansion of the area planted to corn and other feed crops as well as some technical crops in the more humid areas of the European

Table 10

Estimated Sown Acreage, Yield, and Production of Grain
in the "New Lands" of the USSR
1954-63

Year	Area Sown to Grain (Million Hectares)	Yield of Grain (Centners per Hectare)	Production of Grain (Million Metric Tons)	Proportion of Total Production of Grain (Percent)
1954	4.3	10.5	4.5	5
1955	18.5	4.3	8	7
1956	26	9.6	25	22
1957	26	5.0	13	12
1958	26	8.8	23	18
1959	23	7.0	16	16
1960	26	6.9	18	18
1961	26	5.8	15	13
1962	25	6.8	17	15
1963	25	4.0	10	11

USSR. In January 1955, Khrushchev proposed to increase the area planted to corn from 4.3 million hectares in 1954 to not less than 28 million hectares in 1960. The program was rapidly implemented, and by 1962 corn acreage reached a peak of 37 million hectares (including corn for grain, silage, and green feed), as shown below:

Year	Million Hectares of Corn	Year	Million Hectares of Corn
1954	4.3	1959	22.4
1955	17.9	1960	28.2
1956	23.9	1961	25.7
1957	18.3	1962	37.1
1958	19.7	1963	34.1

The abnormally high corn acreages in 1956, 1960, 1962, and 1963 are the result of part of the large acreages of wheat that were winterkilled being reseeded to corn, although most of the expansion in 1962 may be accounted for by the program to replace sown grasses, oats, and fallow with corn, pulses, and sugar beets. The size of the corn crop (grain and ensiled immature ears, expressed in grain equivalents) has fluctuated from lows of 7 million to 8 million tons in 1957 and 1959 to a high of 19 million tons in 1961. These fluctuations in output are

attributable primarily to variations in weather from season to season. However, the inexperience of Soviet farmers in growing corn, the lack of locally adapted hybrids, and shortages of equipment have tended to hold down the yields of corn per hectare. Nevertheless, the corn program has contributed considerably to the feed supply and to increases in output of livestock products. On the other hand, the large expansion of corn, a late-maturing crop, in the traditional winter wheat areas frequently has caused delays in the seeding of winter wheat, which, in turn, increased the danger and, in some years, the extent of the winterkill. 28/

The USSR has been relatively unsuccessful in increasing production of potatoes (see Table 38*). Although the acreage planted to potatoes expanded somewhat from the low level of the early 1950's, it has declined in recent years to a level only slightly higher than in 1953. In addition, potato yields did not increase during 1954-63. The increase in production of other vegetables since the early 1950's is accounted for through increased yields (see Table 39**).

Production of most technical crops in the USSR increased rapidly during 1954-63. The amounts of sugar beets, sunflower seeds, and fiber flax produced in recent years are double the size of the harvests in 1953-54 (see Tables 41, 42, and 43***). The increase in production of sugar beets is largely the result of an expansion in acreage, whereas increased yields accounted for most of the increase in sunflower seeds and fiber flax. Increases in production of cotton have paralleled the increase in the irrigated area (see Table 40†).

C. Animal Husbandry

1. Number of Livestock

The number of most types of livestock in the USSR has increased considerably since 1953 (see Table 45††). The following tabulation shows the number of the principal types of livestock in the USSR in January 1964 and the percentage change since January 1953:

* Appendix A, p. 105, below.
** Appendix A, p. 106, below.
*** Appendix A, pp. 108, 109, and 110, respectively, below.
† Appendix A, p. 107, below.
†† Appendix A, p. 112, below.

Type of Livestock	Number as of 1 January 1964 (Million Head)	Change 1 January 1953 - 1 January 1964 (Percent)
Cattle	85.4	51
Of which:		
Cows	38.3	58
Hogs	40.8	43
Sheep	133.9	42
Goats	5.6	-64
Horses*	9.1	-41

The rapid growth in the number of livestock from 1 January 1953 to 1 January 1964 is less impressive when compared with the January 1928 (precollectivization) levels within comparable boundaries. The number of hogs regained the level of 1928 only by 1953, of sheep by about 1956, of total cattle by 1958, and of cows by 1959. The number of goats declined to the level of 1928 in 1958 and is now below the level of 1916. The number of horses in January 1963 was 25 percent of the level of 1928; donkeys and mules probably declined similarly. Camels, numbering more than 1.8 million head in 1928, now total only about 100,000 head. The present reindeer herd of approximately 1.3 million head probably approximates the level of 1928.

The total number of livestock, aggregated in terms of animal units based on feed requirements,** probably did not regain the level of 1928 until 1961-62; the peak number in January 1963 was only about 9 percent above the level of 1928 and subsequently declined to the level of 1928 in January 1964. The present number of livestock, in aggregate terms, and, consequently, the feed requirements are roughly at the level of 1928, but production of livestock products is considerably higher. Although some of the increase in production of livestock products is attributable to an improvement in the quality of livestock, much of the increase can be explained by the savings in feed resulting from the reduction in the number of horses, donkeys, mules, camels, and cattle used for draft power.

* The number of horses and the change since 1 January 1953 relate to 1 January 1963 because the number of horses as of 1 January 1964 is not available.

** Weights and animal classes used for aggregation are as follows (cows equaling 1.00): cattle, 0.76; hogs, 0.25; sheep, 0.12; goats, 0.11; and horses, 0.76. 29/

2. Production and Availability of Feed

The estimated total supply of feed (in terms of feed units*) in the USSR increased by approximately one-third between the average for 1954-55 and for 1959-62 and reached an average of about 200 million tons in the latter period (see Table 11). A record level of feed production of 239 million tons was reached in 1958 largely because abundant rainfall produced an excellent growth of pasture grasses, an amount believed to have been far in excess of what the grazing livestock herds could consume. The decline in total feed supply to an estimated 180 million tons in 1963 was due primarily to unfavorable weather conditions during the growing season.

Of the different types of feed, the supply of succulent feeds registered the largest and most consistent increase during the period, the supply of succulent feeds in 1961-62 being on the average about 3.7 times the average for 1954-55. Almost all of this increase was accounted for by corn harvested as silage and as green feed. About 80 percent of the total corn acreage in the 1955-63 period was harvested as succulent feed. The quantity of sugar beets fed increased considerably between 1955 and 1962. Much of the increase in the feeding of sugar beets, however, was offset by a decline since 1959 in production of forage roots. The use of potatoes for feed (a succulent feed) has not shown a consistent trend during 1954-63.

The increase in the supply of concentrated feeds (grain and byproducts) during 1954-63 was not as sharp as that of succulent feeds. The average amount of concentrated feeds available in 1961-62, however, was almost 30 percent greater than the average level of 1954-55.

Very little change occurred in the total supply of coarse feeds (hay and straw) during 1954-63 except for 1958 and 1963. The supply of hay increased about 10 percent during 1961-62 above the average for 1954-55, but the use of straw for feed probably did not change significantly, in spite of a general trend toward greater production of cereal grains. Although the acreage of cultivated hay land increased during the 10-year period, the native hay area declined.

Production of feed from pasture, with the exception of 1958, was fairly constant during 1954-63 because the area devoted to pasture in the USSR was relatively stable. The degree of the utilization of pasture grasses by the livestock herds, however, is believed to have increased during the 10-year period.

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* In this report the various kinds of feed materials are aggregated by a set of weights that measure their feed value relative to that of oat grain. These weights are given in Table 47, footnote a (Appendix A, p. 114, below).

Table 11

Estimated Net Availability of Feed Units in the USSR, by Type a/
1954-63

Million Metric Tons

Year	Type of Feed				
	Concentrated b/	Succulent c/	Coarse d/	Pasture e/	Total
1954	32	9	45	54	141
1955	39	14	46	57	155
1956	46	22	47	59	174
1957	48	26	47	60	181
1958	49	34	51	106	239
1959	52	39	54	61	206
1960	43	46	51	60	200
1961	43	41	51	59	194
1962	49	45	50	60	204
1963	40	38	45	57	180

a. Feed units are in terms of 1 ton of oat grain. For a more detailed breakdown of the estimated gross production and net availability of the various livestock feeds in the USSR during the period 1953-63, see Tables 46 and 47 (Appendix A, pp. 113 and 114, respectively, below).
b. Concentrated feeds are largely grain and byproducts such as mill feed and oilseed cake or meal.
c. Succulent feeds include silage, potatoes, sugar beets, forage roots, forage melons, green corn, and sugar beet tops.
d. Coarse feeds include hay and straw.
e. Pasture feeds are grasses.

The composition of the total feed supply in the USSR changed somewhat during 1954-63. Succulent feeds as a proportion of the total supply of feed increased in relative importance from an average of 8 percent in 1954-55 to 22 percent in 1961-62. The proportion of concentrated feeds remained largely unchanged between these two periods, while coarse feeds declined from 31 percent to 25 percent of the total and pasture feeds from 38 percent to 30 percent.

3. Livestock Products

With minor exceptions, production of all livestock products in the USSR increased annually throughout the 1953-63 period (see Table 48*). The total increase in this period is substantial even after

* Appendix A, p. 115, below.

Soviet statistics are discounted to remove the combined effects of a deliberate upward bias and of valid errors in estimation.

Production of meat* in the USSR during 1958-63 averaged 7.7 million tons and was one-third more than that for 1953-57. The level of production of meat in 1928 probably was not regained until 1952-53 and the level in 1929 not until 1955-56. The increases in production of meat generally paralleled the increases in the aggregate number of animals used primarily for production of meat.** The aggregate level of meat-producing animals in 1928 was regained in 1957, the levels of January 1963 were 60 percent above 1953 and 42 percent above 1928, and the levels of January 1964 were about 9 percent below 1963 and only 28 percent above 1928.

The somewhat greater increase in production of meat than in the number of meat-producing animals reflects (a) fewer cattle being used for draft power, (b) the more rapid increase in the number of hogs compared with other meat-producing animals, and (c) perhaps some improvement in the quality of the livestock herds and livestock feed. Pork comprised 42 percent, beef and veal 34 percent, mutton and goat meat 12 percent, poultry meat 9 percent, and meat from other animals 3 percent of the total production of meat during 1959-63. The corresponding percentages for 1928 were pork, 33; beef and veal, 43; mutton and goat meat, 19; poultry meat, 5; and an insignificant amount of meat from other animals.

Production of milk in 1959, estimated at 56.1 million tons, was 62 percent higher than in 1953 and 81 percent higher than in 1928 (see Table 48***). Gains in output of milk between 1928 and 1959 were largely the result of higher yields per animal. Although improved feeding and breeding undoubtedly have contributed to increased yields per cow, much of the increase can be attributed to the fact that cows in 1928 were much more all-purpose animals (a draft and meat source as well as milk producers) than in more recent years. There has been little change in production of milk since 1959 because annual increases in the number of cows have been offset by decreased yields of milk per cow. This relationship probably is due to poorer feeding practices resulting from a more rapid increase in the number of cows than in the supply of feed for them.

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* Production of meat is measured in terms of carcass weight, including slaughter fats and edible offal obtained from cattle, hogs, sheep, goats, poultry, horses, rabbits, camels, and reindeer. It does not include increases in the inventory weight of livestock left on the farms.

** Aggregation of cattle, hogs, sheep, and goats with the same weights as used earlier. Horses have been excluded, for they are used primarily for draft power.

*** Appendix A, p. 115, below.

Production of wool* increased 59 percent during 1954-63 and at 374,000 tons in 1963 was double that produced in 1928. Thus production of wool has increased more rapidly than the number of sheep, indicating an increase in the yield of wool per animal.

Production of eggs declined by 4 percent in 1963 compared with the peak of 30.1 billion eggs produced in 1962, but production of eggs in 1963 was 79 percent higher than in 1953 and 167 percent higher than in 1928. Almost all of the eggs produced in recent years have been chicken eggs. Flocks of poultry in the USSR increased by about two-fifths during the past decade.

4. Catch-Up Campaign**

In May 1957, Khrushchev launched a campaign to catch up with the US in production of certain livestock products. He boasted that the USSR would overtake the US in production of milk per capita in 1958 and in production of meat per capita in 1960 or 1961. These goals, of course, were not met. In 1956 the USSR was producing 73 percent of the milk and 44 percent of the meat implied by the goal (see Table 12***). By 1963 the USSR was within 9 percent of attaining the level of production of milk per capita in the US but had reached only 62 percent of the level of production of meat per capita in the US.

Greater emphasis has been given in the USSR to increasing the number of livestock as a means of expanding production than to increasing output per animal as in the US. In 1962 the USSR had a greater aggregate number of cattle, hogs, and sheep than the US had -- from 1950 to 1962 the aggregate number of livestock increased by about 60 percent in the USSR compared with only 20 percent in the US. Hogs in the USSR require twice as long to reach comparable weight as do hogs in the US. The official milk yield per cow in recent years in the USSR is only about half of that in the US. Production of eggs per hen in the USSR is perhaps one-fourth of that in the US. These differences can be explained partly by climatic factors, by the different combinations of feed available, and by the different breeding programs in the two countries. The Soviet emphasis on increasing the size of herds, which apparently has resulted in a faster increase in the number of livestock than in the feed supply, probably has resulted in a decline in feeding efficiency. The total production of livestock products in the USSR probably would have been higher if the available feed had been distributed among fewer animals.

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* Production of wool is given on a grease basis; production of scoured wool probably increased less, although quality probably improved.

** Throughout the discussion of the catch-up campaign, Soviet statistics are used. For official Soviet data and estimates of production of meat and milk, see Table 48 (Appendix A, p. 115, below).

*** P. 40, below.

Table 12

Comparison of Official Production with Catch-Up Campaign Goals for Meat and Milk in the USSR
1956 and 1963

Million Metric Tons

Livestock Product	1956			1963		
	Official a/	Goal b/	Gap c/	Official a/	Goal b/	Gap c/
Meat	6.6	15.0	-8.4	10.2	16.4	-6.2
Milk	49.1	67.3	-18.2	61.2	67.1	-5.9

a. Official Soviet statistics.
b. The level of production that would be required for the USSR to match the US in production per capita.
c. The difference between the official production and the goal for production implied by the catch-up campaign.

5. Feed-Livestock Production Ratios

Comprehensive data on feeding practices and efficiency in feed utilization in the USSR are not available. The relationship between feed used and output of livestock products achieved in the US is not directly applicable to conditions in the USSR, because the proportion of grains and other concentrated feeds in the total feed supply is much less in the USSR than in the US and because some of the feeds used in the USSR are not used in the US. There also are differences between the US and the USSR in the types of livestock raised and in the types of livestock products produced. Errors in estimating production of gross feed as well as the extent of losses of feed crops in harvesting, storage, and feeding also affect the magnitude of feed quantities that are related to the subsequent output of livestock products and hence the measurement of feeding efficiency.

In 1955 the USSR published norms for feeding efficiency that expressed kilograms of oat feed units required to produce 1 kilogram of livestock product.* The Soviet feed norms, including the percentages

* The USSR also expresses feed norms as quantities of feed per animal per year. These were used to estimate the feed required for draft animals and for aggregating the number of livestock. The direct relationship of feed per unit of product is more relevant for estimating the feed required for livestock products.

of the total feed units to be supplied by various types of feeds, are shown in Table 13.* These norms were used as factors for converting estimated production of livestock products and animal draft power in 1954-62 to oat feed units required to produce them. The feed requirements were then compared with the estimated availability of feed in 1954-62, which also was expressed in oat feed units (see Table 47**). On the average, the estimated availability of feed exceeded the "norm" requirements by about 10 percent.*** This excess of the availability of feed above requirements indicates that the USSR failed to meet its norms of feeding efficiency during 1954-62. Khrushchev and others frequently have criticized the agricultural enterprises for exceeding their feeding norms. Therefore, the norms were adjusted upward by 10 percent in arriving at estimates of the actual feed-livestock production ratios prevailing in the USSR. The resulting feed-livestock production ratios are as follows: 12.13 tons of oat feed units per ton of meat; 1.1 tons, per ton of milk; and 220 tons, per million eggs.

D. Agricultural Situation in 1963-64

The USSR in 1963 experienced an extremely poor year for agricultural production. Unfavorable weather adversely affected production of crops and the growth of pasture in the traditional agricultural areas of the European USSR as well as in the "new lands" areas of Siberia and Kazakhstan. The harvest of crops as a group in 1963 was one of the worst in almost a decade. Probably as a result, little information has been published concerning production of the various crops in 1963. In addition, the decline in the number of hogs caused by inadequate feed supplies probably will require several years to overcome.

The acreage occupied by grain crops in the USSR in 1963 reportedly was about 2 million hectares less than the record of 136 million hectares devoted to grain crops in 1962. A record 42 million hectares of winter grain (mainly wheat and rye) were seeded in the fall of 1962 for harvest in 1963. Unusually dry conditions, however, prevented the germination of the winter grains in some areas, and harsh winter conditions resulted in heavy winterkill. As a result, only 31 million hectares were harvested as grain, although 2 million to 4 million hectares in addition probably were harvested as hay or were ensiled. Also, yields were low on the area harvested for grain because of reduced stands and dry weather. In an attempt to offset the adverse effects of weather on the winter grain crop, a record area of grain (primarily wheat, barley, corn, and pulses)

* P. 42, below.

** Appendix A, p. 114, below.

*** Estimated availability and supply of feed as used in this report approximate consumption of feed by livestock, for deductions have been made from gross production to exclude losses and overestimation. The few statistics on feed published by the USSR indicate that the gross supply of livestock feed was substantially higher than the "norm" requirements, perhaps by as much as 50 percent.

Table 13

Norms of Oat Feed Units and Types of Feed
Required to Produce One Unit of Livestock Product in the USSR a/

Livestock Product	Norms of Oat Feed Units for Production of One Unit of Product (Kilograms)	Norms, by Type of Feed (Percent)				
		Concentrated Feeds	Nonconcentrated Feeds			
			Succulent	Coarse	Pasture	Total
In 1 kilogram of						
Milk	1.0	20	22	18	40	80
Meat, liveweight						
Cattle	7.3	24	20	22	34	76
Hogs	6.3	60	24	7	9	40
Sheep	10.0	12	4	31	53	88
Poultry	6.0	75	10	5	10	25
Eggs	3.6	80	10	5	5	20
Per head per year						
Horses b/	2,500	30	4	38	28	70

a. Source 30/ unless otherwise indicated.
b. Estimated on the basis of information in source 31/.

however, the area harvested in 1964 was reduced considerably by fall drought that prevented seed germination and by winterkill. Although only a fair winter grain crop was harvested in 1964, generally good growing conditions in 1964 throughout much of the USSR, coupled with ample moisture in the principal "new lands" area, assured a good spring grain crop.

E. Levels of Diet and Consumption

The Soviet consumer, long neglected by Stalin, realized a marked improvement in his diet during 1955-58 as a result of the rapid increase in agricultural production. Throughout 1953-63 the Soviet people are believed to have had available for consumption a sufficient quantity of food. The daily caloric intake per capita in the USSR is estimated to have remained within the range of 3,100 to 3,200 calories during this period (see Table 49*). Because the diet was already adequate in the number of calories, the improvement in the diet was in terms of quality rather than quantity. During the 2-year period 1961-62 the availability of meat per capita is estimated to have been about one-fourth greater than during 1953-54, and the increases in availability of certain other quality foods are estimated as follows: milk, 40 percent; fish, about 60 percent; and vegetables (other than potatoes) and vegetable oil, about 20 percent (see Table 14). As a result, the so-called low-quality foods (cereal products and potatoes) in the diet declined from almost 70 percent of the total calories consumed during 1953-54 to about 60 percent during 1961-62.

The Soviet consumer was conditioned to expect continued improvements in his lot during 1955-58 -- the period of most rapid improvement in his diet. A prime example of this conditioning was Khrushchev's boast in May 1957 that the USSR would catch up with and surpass the US in per capita production of meat and milk.

There has been little change in net agricultural production in the USSR since 1958, and the changes in per capita availability of food products (except fish and sugar) since 1958 reflect this stagnation in agricultural output. During 1961-63, there were several reports of civilian unrest associated with dissatisfaction over the food supply. Shortages of livestock products and the lack of profitability in the livestock industry prompted the regime to raise the state purchase prices for some livestock products in June 1962. This markup was passed on to the consumer -- a move that proved to be unpopular, particularly with the lower income group, which undoubtedly was forced to reduce its purchases of livestock products. Shortages of food, particularly potatoes, were widespread in the densely populated northern European USSR during the winter of 1962-63. The very poor wheat crop in 1963 forced the regime to halt retail sales of flour to prevent hoarding, to increase extraction rates, and to lower the quality of bread by using feed grains and other additives in baking. Local shortages of bread and other food products occurred during the winter of 1963-64.

* Appendix A, p. 116, below.

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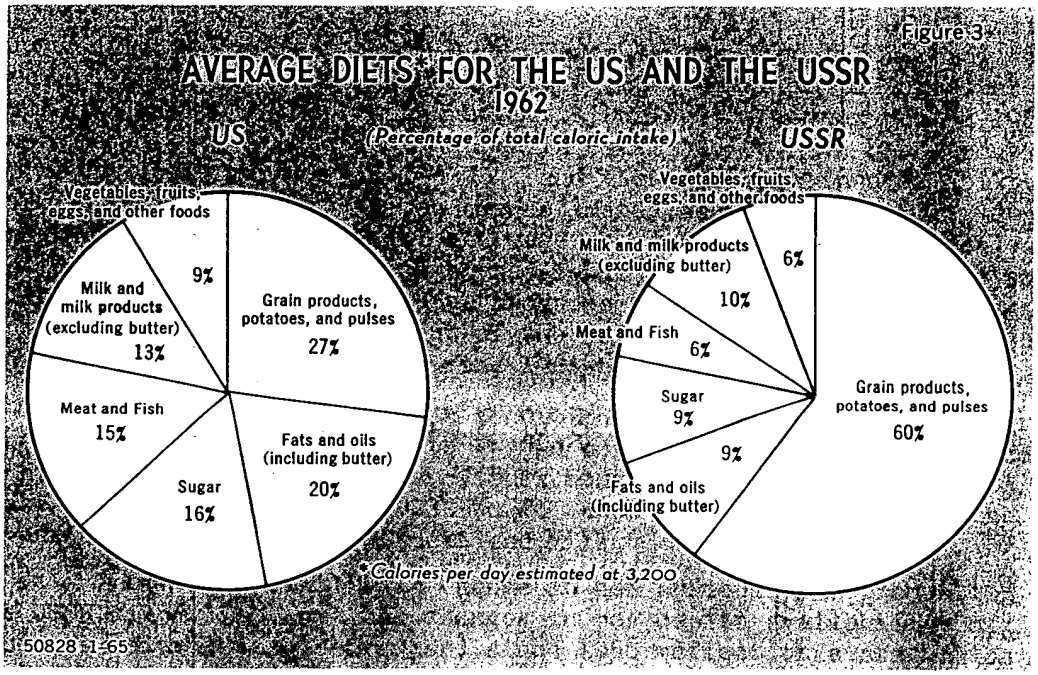
Table 14

Estimated Availability of Food for Human Consumption in the USSR
Selected 2-Year Averages, 1953-62

Food Product	Food Value b/ (Calories per Kilogram)	Average Number of Calories Per Capita per Day a/		
		1953-54	1958-59	1961-62
Meat (net of slaughter fats)	1,980	135	165	167
Edible slaughter fats	7,800	52	63	63
Milk	600	275	392	385
Fish	500	9	12	15
Sugar	3,483	174	241	288
Potatoes	700	303	268	254
Other vegetables	210	35	41	43
Vegetable oil	8,840	110	130	133
Flour	3,300	1,849	1,727	1,695
Other (residual)		158	161	157
Total		3,100	3,200	3,200

a. Data on the average number of calories per capita were derived by multiplying the estimated availability of food products for human consumption as given in Table 49 (Appendix A, p. 116, below) by the food value in terms of calories per kilogram and dividing by 365 to convert to a daily basis.
b. 32/

In spite of the improvement during the period from 1953-54 to 1961-62, the average Soviet diet remains high in starchy foods, with about 60 percent of the daily caloric intake derived from grain products, potatoes, and pulses compared with 27 percent in the US (see Figure 3). In addition, the absence of any sizable area in the USSR climatically suitable for winter production of vegetables, plus the lack of refrigeration and rapid transport facilities, imposes a monotony in the diet during the winter season because of the absence of fresh or frozen fruits and vegetables. Inadequate refrigeration and transportation facilities also affect adversely the regional distribution and ready availability of other perishable food items such as meat, fish, and milk.



IV. Why Soviet Agriculture Is a Problem Today

A. For the USSR

During the first 5 years of the Seven Year Plan, agricultural production in the USSR, by its own admission, remained at about the level of 1958. Although unfavorable weather was an important factor inhibiting the growth of agricultural production during this period, other factors discussed in II, above, probably were even more important. For example, the sale of machinery to the collective farms was not the panacea envisioned by Soviet leaders but actually added a financial burden to the collective farms that was not compensated for by the procurement prices set for agricultural products. Inadequate investments by the state and inadequate incomes of the collective farms jointly contributed to the failure to provide the necessary inputs and incentives for growth. Irrational planning or the lack of planning further complicated the agricultural picture as revealed by the method of implementation of the program to shift the use of land in sown grasses, oats, and fallow to more productive crops such as corn, sugar beets, peas, and beans.

For the USSR the problems arising from the stagnation of its agricultural economy have serious implications, both domestic and foreign. Agriculture and industries based on agricultural raw materials contribute heavily to Soviet gross national product (GNP). Consequently, a stagnant agricultural economy has a significant impact on economic growth in the USSR. Soviet officials have pointed out that "the disproportion between industry and agriculture that had arisen before 1953 could again exert its negative influence on the development of industry and the economy of the country if the tempo of growth of agricultural production is not raised immediately." 33/

Because agricultural products and products manufactured from agricultural raw materials are primarily for human consumption, the Soviet consumer has felt most keenly the recent lack of progress in agriculture. With the gradual improvement in living standards since 1953, the quantity and quality of foodstuffs increased considerably in the post-Stalin period but probably reached a peak in the early 1960's. The deteriorating food situation in recent years and the substantially increased prices for some products -- meat, milk, and butter in particular -- as well as the slowdown in housing construction have hit the consumer hard. Shortages of food have been the source of considerable discontent and on occasion have been a factor in causing local riots. The net import of about 11 million tons of wheat from the West in 1963-64 probably was prompted in part by the reluctance of the regime to risk widespread discontent, the lowering of morale, and a drop in labor productivity.

On the international scene the image of the USSR as the chief proponent of Marxist socialism -- a source of abundant life for the

people -- has been dealt a severe blow by the record of its sluggish agricultural economy and by the sudden and dramatic reversal of its role as a substantial net exporter of grain. The "cup of abundance" which Communism is supposed to represent and which the Soviet leaders have so diligently fostered is cracked and leaking and is in need of repair. If the world Communist movement is to be enhanced, the Soviet leadership must view as a major goal the restoration of the image of the USSR as a dynamic socialist economy capable of overcoming all obstacles. In developing this theme, Khrushchev in March 1962 appropriately stated 34/:

> Communism cannot be depicted as a table laid with empty plates and occupied by highly conscious and completely equal people. To invite people to such Communism is tantamount to inviting people to eat soup with a fork. This would be a caricature of Communism.

B. For the US

For the US, too, the problem of Soviet agriculture takes on economic and ideological, as well as military, dimensions. From the ideological point of view the principal challenge is whether socialized agriculture in general -- based on impersonal, large farms that are owned and operated by the state -- can be as successful as agriculture based on relatively small family farm units as in Western nations. To date, Soviet agriculture as a whole has failed to measure up to that of the US and other advanced Western nations, and there is little to recommend Soviet socialized agriculture as a model for emulation by the less developed countries.

Soviet leaders can be expected to continue in their attempts to find solutions for their agricultural problems, possibly even by modifying to some extent the ideological straitjacket in order to bring about the desired results. Technological advances that have brought large gains to agriculture in Western countries during the past two decades cannot fail to become at least partially operative in the USSR, which has borrowed heavily from the West to become the second greatest industrial power in the world. Although socialized agriculture has many disadvantages and a long history of inadequate success, the possibility of large increases in agricultural output, particularly given massive inputs, definitely exists. Also, one should not underestimate the potential inherent in the facts that the prevailing level of output per unit of land and animals is low on a majority of farms and that manifold inefficiencies exist. The elimination of even the crudest deficiencies would yield significant results. However, the USSR is unlikely, during the next 5 or 6 years, to be able to provide for its people a standard of living comparable to the average

in the industrial countries of Western Europe, to say nothing of the higher standard prevailing in the US.

Although a leading agricultural country, the USSR, because of its agricultural difficulties, has not presented a serious challenge to US markets for agricultural products except in the export of grains. Soviet statistics purport to show that agricultural production in the USSR has been growing faster than in the US, but this comparison of rates of growth is not particularly appropriate, because the US has been striving to limit agricultural production while the USSR has been attempting to achieve a standard of living comparable to that in the US.

With such agriculturally productive land as it has, the USSR in years of favorable weather may seriously challenge the US position in world agricultural markets, especially in wheat. The wise use of modern technology and adequate incentives to farmers could help mitigate the climatic drawbacks. Indeed, if the USSR could solve its agricultural problem, this achievement, because of the greater natural handicaps, probably would rate an international acknowledgement as great as that for its industrial successes.

V. Soviet Goals for 1970 and Proposed Means of Meeting Them

A. Planned Agricultural Goals

The Twenty Year Plan (1961-80) for the development of the Soviet economy, adopted at the XXII Congress of the Communist Party in October 1961, called for gross agricultural production to exceed the level attained in 1960 by 150 percent in 1970 and by 250 percent in 1980. Annual increases in gross agricultural production of 9.6 percent during the decade of 1961-70 and 3.4 percent during the decade of 1971-80 would be required to attain these goals.

The goals for production of certain agricultural commodities by 1970 appear to have been somewhat modified. Khrushchev at the Party Plenum on the chemical industry in December 1963 announced the planned goals for 1970 for grain, meat, milk, and eggs (see Table 15*). The lower limit of the range given by Khrushchev for production of grain in 1970 is equal to the goal in the Twenty Year Plan. The higher figure for grain probably reflects the benefits expected to be derived from the fertilizer and irrigation programs. The upper limits of the ranges given by Khrushchev for production of meat and milk are equal to the goals in the Twenty Year Plan. This apparent lowering of the goals for meat and milk probably is due to a more realistic (hence more pessimistic) appraisal of the potential in animal husbandry as a result of the poor performance of the Soviet livestock industry in recent years. The figure given by Khrushchev for production of eggs in 1970 was the same as the original goal.

In evaluating the agricultural goals for 1970, it is important to note that plans for Soviet agriculture have always been of heroic proportions. As seen in Table 15, the planned output for 1970 of those commodities for which data are available far exceeds the average production for the 1958-62 period as calculated from official statistics. Compared with the estimated output, especially for grain, the goals for 1970 are even more remote. Production of agricultural commodities in the past has nearly always fallen far short of planned goals. A comparison of the planned goals for 1960 -- the goals of the Sixth Five Year Plan (1956-60) that was abandoned in 1958 -- with the average level of production during 1958-62 as given in Table 15 provides an example of past performance relative to planned goals. Except for production of sugar beets, which was the result of a large increase in acreage, production of all commodities during 1958-62 fell far short of the planned goals for 1960.

There never has been any evidence that Soviet agricultural plans are arrived at by a serious and systematic calculation of required inputs versus a reasonable expectation of outputs. Rather, the plans generally seem to involve three elements: (1) a notion of

* P. 52, below.

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Table 15

Official and Estimated Production of Selected Agricultural Commodities in the USSR
1958-62 Average and Planned Goals for 1960, 1965, and 1970

Million Metric Tons a/

Item	Average Annual Production 1958-62		Planned Goals		
	Official	Estimated	1960	1965	1970 b/
Grain	137.5	111.0	180	164 to 180	229 to 262
Cotton	4.4	4.4	6	5.7 to 6.1	6.8
Sugar beets (for processing)	50.9	50.9	48	76 to 84	86
Sunflower seed	4.23	3.89	N.A.	N.A.	6.5
Potatoes	82.3	82.3	133	147	140
Meat	8.7	7.5	12.6	16	20 to 25
Milk	61.7	56.1	84	100 to 105	115 to 135
Eggs (billion units)	27.1	27.1	47	37	68
Wool	0.354	0.354	0.466	0.548	0.8

a. Unless otherwise indicated.
b. Based on source 35/.

"needs" (that is, what would be required to equal or surpass per capita output in the US or to meet "scientific norms" of consumption); (2) a notion that all farms ought to be able to do as well as the best farms; and (3) propaganda and politics, both domestic and international. In spite of some success, Khrushchev's favorite agricultural endeavors -- the "new lands" and the corn expansion programs and the catch-up livestock campaign -- seem to have been ad hoc, poorly planned and executed, and based on unrealistic expectations.

Even when seemingly attainable plans have been set forth, the necessary inputs have not been made available in order to realize planned goals. Furthermore, agricultural plans invariably have been corrupted either by the government bureaucracy or by the Party or by both in their zeal to implement centrally determined goals. Planning and decision-making at the farm level, which are so necessary in agriculture, have been largely fictional. A decree of 1955 presumably gave the farm managers the right to plan production but with the restriction that production be sufficient for the farm to fulfill its part of the national procurement goals. These production plans, however, were subject to review by local administrative organizations that could revise the farm

plans and, in effect, negate any planning at the farm level. A new decree adopted in March 1964 36/ is directed toward insuring that the farm will have the final decision in any differences that arise in planning between the farms and local administrative organizations. The basic antagonism between centrally directed goals and locally planned production, however, remains, and the farm, as in the past, probably will continue to have to tolerate interference, perhaps more subtle, from the state and the Party.

There is little doubt that the extremely poor performance of Soviet agriculture in 1963 was the catalyst which triggered the commitment by the leadership of substantial resources into agriculturally associated industries but particularly the fertilizer industry. Although Khrushchev's agitation in recent years for increased investments for agriculture began in March 1962, the resources were not made available to the agricultural economy in the requisite amounts to effect the planned increases in production. Plans for increasing production of mineral fertilizers and expanding the irrigated acreage are not new, but the crisis in Soviet agriculture unquestionably demands a more serious approach by the leadership toward the solution of the agricultural problem.

The main feature of the new agricultural program is the proposed intensification of agriculture.* Increased productivity per hectare of cropland is to be achieved by greatly increasing the use of mineral fertilizers and pesticides and by improved seed and expansion of irrigation. In particular, small grains, only a small part of which was fertilized in the past, are to be fertilized more heavily, especially in the more humid regions, where the greatest response to fertilization can be expected. The USSR plans to increase productivity in animal husbandry not only by an improvement in the supply and quality of livestock feed but also by feeding synthesized protein (urea), vitamins, and growth stimulants. As discussed in VI,** however, there are several factors that are expected to minimize any gain in productivity in the Soviet livestock industry by 1970.

B. Agricultural Chemicals Program

1. Fertilizers

The Soviet Seven Year Plan for the chemical industry announced by Khrushchev in December 1963 calls for production of fertilizers

* Plans for the intensification of Soviet agriculture are not new. For example, the Seven Year Plan relied on increased output per unit of land and livestock for most of the planned increase in production.
** P. 67, below.

in terms of standard units* to rise from about 20 million tons in 1963 to 70 million to 80 million tons in 1970. In addition to the increase in the quantity of chemical fertilizers to be produced, improvements also are to be made in quality. The average nutrient content of Soviet fertilizers in 1970 is scheduled to rise by more than one-third compared with that in 1963. 37/ Also, according to plan, granulated and noncaking fertilizers are to comprise 70 percent of the total output by 1970 compared with 45 percent in 1963.

About 4.5 billion rubles, or 18 percent, of the total direct investment planned in the chemical industry are to be invested to achieve the goal for production of fertilizer. 38/ It is planned to increase the capacity of existing fertilizer plants by 20 million tons, and 55 additional fertilizer installations are to be built, including 28 nitrogen fertilizer plants, 19 phosphate fertilizer plants, 6 potassium ore mines, and 2 phosphate meal plants. 39/

Ambitious plans also have been laid for construction of storage facilities for chemical fertilizers. Although available information on the subject appears to be somewhat inconsistent, the most recent source indicates that the program calls for construction of storage facilities for chemical fertilizers with a total capacity of 27 million tons.** 41/ Of this amount, 11 million tons are to be provided by large regional warehouses at central points already served by railroads. The remaining 16 million tons are to be constructed on the farms by the state and collective farms. The total expenditure of funds in the 1964-70 period for this construction by both the state and the farms is estimated at approximately 1 billion rubles.

A number of obstacles confront Soviet planners in their effort to expand the fertilizer industry. These include previous shortcomings associated with the lag in the development of new technology and equipment and shortages of technical and skilled labor and specialized materials. Construction of both fertilizer plants and storage facilities has been lagging significantly behind plan and in spite of some improvement probably will continue to do so through 1970. In view of the substantial problems of implementation, attainment of the upper limit of the present goal to produce 70 million to 80 million tons of fertilizers in 1970 is believed to be most improbable. Alternative estimates for production of chemical fertilizers in the USSR based on output of 60 million and 70 million tons, respectively, in 1970 and the likely allocation to agriculture are shown in Table 16. The level of output of 60 million

* In converting mineral fertilizers from nutrients to standard units, the USSR uses the following factors: nitrogen, 20.5 percent N; potassium, 41.6 percent K_2O; phosphorus, 18.7 percent P_2O_5; phosphorite meal, 19 percent P_2O_5; and small amounts of boromagnesium and boron fertilizers expressed as 7.5 and 10 percent boric acid, respectively.

** Information on requirements for storage in the RSFSR suggested that storage capacity for about 60 percent of the production goals for 1970 for mineral fertilizers would be required. 40/

Table 16

Alternative Estimates of Soviet Production and Allocation of Chemical Fertilizers to Agriculture
1970

Type of Fertilizer	Based on an Estimated Production of 60 Million Metric Tons		Based on an Estimated Production of 70 Million Metric Tons	
	Production a/ (Thousand Metric Tons)	Allocation to Agriculture b/ (Thousand Metric Tons)	Production a/ (Thousand Metric Tons)	Allocation to Agriculture b/ (Thousand Metric Tons)
Nitrogen (20.5 percent N)	22,680	18,800 c/	26,460	22,000 c/
Potassium (41.6 percent K_2O)	11,640	9,300	13,580	10,900
Phosphorus (18.7 percent P_2O_5)	20,040	18,600 c/	23,380	21,700 c/
Phosphorite meal (19 percent P_2O_5)	5,520	4,910	6,440	5,730
Boromagnesium and boron (7.5 and 10 percent boric acid, respectively)	200	200	200	200
Total	60,080	51,810	70,060	60,530

a. The estimates of fertilizers by type for both alternatives of total output in 1970 are based on the proportion of each given in a Soviet plan based on production of 80 million tons per year. 42/ An exception is made for boron fertilizers, inasmuch as annual production of these is scheduled to reach 200,000 tons as early as 1964. Thus the resultant production totals are slightly in excess of 60 million and 70 million tons, respectively.

b. The estimated supply to agriculture is based on the proportion of each type (excluding boron) planned for supply to agriculture in 1964. 43/ Data for the estimated supply to agriculture (with the exception of totals) have been rounded to three significant digits and do not include any allowance for losses during transportation and storage.

c. Nitrogen and phosphorus fertilizers allocated to Soviet agriculture include nitrogen and phosphorus to be used for fodder as well as for crops. If the availability of fertilizer for crops alone is desired, the first alternative for nitrogen fertilizers (18.8 million tons) should be reduced by 1.5 million tons and the second (22 million tons) by perhaps 1.9 million tons. Similarly the first alternative for phosphorus fertilizers (18.6 million tons) should be reduced by perhaps 1.6 million tons and the second by 2.1 million tons. The estimates are based on a Soviet plan for 1970, with some adjustment for the lower alternative output of fertilizer. 44/

tons in 1970 is considered to be the more probable of the two alternative estimates. The estimates of availability for agriculture in Table 16, however, do not include any allowances for losses incurred in handling, transportation, and storage, which in recent years have been averaging about 20 percent of the total supply.

The amount of chemical fertilizers that will be lost or wasted in the USSR by 1970 is open to serious question. It is estimated, however, that losses will amount to some 10 to 20 percent of the total output in 1970. Thus as much as 10 million to 12 million tons of the 50 million to 60 million tons of chemical fertilizers allocated to agriculture in 1970 may be lost. The loss of such a large quantity of fertilizer is almost inconceivable, but so is the loss of 3 million to 4 million out of 15 million to 20 million tons in recent years, particularly when chemical fertilizers have been in such short supply relative to requirements and when chemical fertilizers currently are being trumpeted as the panacea to Soviet agricultural problems. Although the planned warehouse capacity for fertilizers by 1970 would reduce losses substantially, past performance suggests that construction of warehouses will not keep pace with the need. Also, if steady progress is made toward the levels of production estimated, annual increment to production of chemical fertilizers by 1970 would be on the order of 10 million tons, or about half of the total production in 1963.

The amount of wastage of chemical fertilizers may become so appalling after the program has been underway for 3 or 4 years that the leadership will decelerate the program and concentrate on achieving greater efficiency in utilization. A deceleration of the program would be expected not only to reduce losses as a proportion of the total output but to reduce the total amount of chemical fertilizers produced in 1970. Thus the actual amount of chemical fertilizers applied to crops in the USSR in 1970 may not be very different given a continuation of the present fertilizer program through 1970 or a deceleration of the program in the latter part of the period. The estimates of production of 60 million to 70 million tons of chemical fertilizers in 1970 (see Table 16) assume a continuation of the present ambitious fertilizer program through the period under study. Thus it is assumed for this report that losses of chemical fertilizers in 1970 will amount to about 15 percent of the total output and that an additional 2 to 3 percent of the total output will not be utilized effectively. Estimates of the amount of chemical fertilizers utilized effectively are shown in Table 18,* by crop, and discussed in VI.**

2. Other Agricultural Chemicals

Few details are available on Soviet plans for expansion of the pesticide industry by 1970. Production is scheduled to be

* P. 72, below.
** P. 67, below.

450,000 tons* (active base), a level of about seven times that of 1963, and the necessary investment appears to be on the order of 2 billion rubles. 45/ Herbicides apparently will be given priority development within the pesticides industry. As was noted with respect to fertilizers, present Soviet plans appear overly ambitious in the light of the present status of the pesticide industry, and a shortfall in plan is likely. As yet, however, information is too scanty to permit an accurate estimate of the probable size of the shortfall. Progress of the industry, however, should be rapid in spite of the probable failure to meet the goal for 1970.

Tentative Soviet estimates indicate that the general requirements for chemicals used in animal husbandry by 1970 will be in the following magnitudes: fodder yeast, 2 million tons; preservatives, 780,000 tons; trace elements, 4,200 tons ; synthetic amino acids, 11,500 tons; vitamins, 1,300 tons; and fodder antibiotics, 500 tons. 46/ The lack of data precludes an assessment of these preliminary goals and the likelihood of their achievement.

C. Current Emphasis on Irrigation

The USSR has always considered irrigated agriculture as an important means of increasing production of certain agricultural products, and significant expansion of the irrigation network has taken place during the course of Soviet rule. The irrigation network in 1963 encompassed about 13 million hectares compared with only 4.3 million hectares in 1928. The area actually irrigated for crop production increased during this period from about 3 million hectares to 8.5 million hectares.

1. Goals for Irrigation-Facility Construction

Soviet long-range plans for irrigation as adopted by the XXII Congress of the Communist Party in October 1961 and reaffirmed at the Party Plenum on agriculture in February 1964 call for some 28 million hectares of irrigated land by 1980.** These plans appear as a broad framework into which the intermediate plans may be fitted. During the 1964-70 period the irrigated area is to be expanded by 5.8 million hectares, bringing the total irrigated area up to approximately 14 million hectares. 47/ The goal for 1970 of 5.8 million hectares of new development includes 2.8 million hectares to be used for production

* According to some versions of the plan, production of 800,000 to 900,000 tons of pesticides is planned. It is possible that the total is not inconsistent with the above figure of 450,000 tons but that the higher figures are expressed in terms other than an active base.

** Presumably this would be actually irrigated land and not land with an irrigation network.

of grain. High-value crops such as cotton, fruits, and vegetables apparently would occupy most of the additional irrigated lands to be developed. About two-thirds of the planned increase in irrigated grain cultivation is to be in the RSFSR, the Ukraine, and Moldavia, with the remainder to be developed in Central Asia and Kazakhstan.

Implementation of plans for construction of irrigation facilities to provide 1.9 million additional hectares of actual irrigation under the current Seven Year Plan (1959-65) appears to have progressed satisfactorily through 1963. It is doubtful, however, that plans for 1970 for construction of new irrigation facilities will be achieved. This skepticism is based on shortcomings that can be expected in the supply of equipment and materials necessary for the projects being undertaken.

The Soviet construction equipment industry has a poor record in achieving series production of new types of construction equipment. Thus the new types of canal construction equipment that are planned for the irrigation program probably will not be available until the latter part of the 1964-70 period. A number of additional factors such as untimely delivery of construction designs and layouts for design-research, extremely poor coordination of construction work in rural areas, and an inadequate supply of concrete flumes and water pipe also will contribute to some underfulfillment of the plans for irrigation construction in 1970.

Inefficiency in the utilization of the land covered by irrigation networks appears at present to be a more serious factor limiting the benefits that can be expected from irrigation developments than the expansion of the irrigation network. To date, the utilization of irrigable land within the networks has been so inefficient that as of 1963 about one-third of the land reportedly covered by an irrigation network was not being utilized for crop production.

The current emphasis on irrigation development is reflected in the increase in investment in the water economy planned for 1964 -- 940 million rubles 48/ compared with 800 million rubles in 1963. 49/ Also, the emphasis on irrigation development is reflected in the sharp increase planned for production of earth-moving equipment for agriculture in 1964. In further support of irrigation construction, the Soviet construction equipment industry plans to achieve series production of several new types of canal construction machinery during 1964-65 -- a rotary excavator for one-pass excavation of canals, a machine for leveling the sides of canals, a concrete-placing machine for canals, and others.

The emphasis currently being put on the development of irrigation facilities is expected to result in a significant expansion in the acreage of crops grown under irrigation in the USSR by 1970. Although the area actually irrigated is not expected to reach the

14 million hectares as planned, an increase of perhaps one-half above the 1963 area of 8.5 million hectares appears to be the most probable level of achievement by 1970.

2. Increased Emphasis on the Growing of Grain on Irrigated Land

The grain crisis in the USSR in 1963 prompted Khrushchev to propose that the acreage of grain on irrigated land be expanded as an aid in stabilizing the grain harvest. Khrushchev's goal was to obtain a "guaranteed" harvest of about 35.5 million tons of grain annually from irrigated areas. 50/ His proposal called for a shift in crop patterns so that the area in grains would increase from 965,000 hectares in 1962 to 2.6 million hectares in 1970 on currently irrigated land. From this area the USSR hoped to obtain annually about 15.6 million tons of grain. In addition, the proposed 2.8 million hectares to be sown to grain on newly irrigated land were expected to furnish 17.6 million tons of grain annually. Finally, double-cropping of the more favorable land in both the planned and the existing irrigation networks was expected to yield 2.3 million additional tons. 51/

Thus, if Soviet goals were achieved by 1970, the 5.4 million hectares of grain grown under irrigation would provide about 35.5 million tons of grain annually. This goal, however, is predicated on obtaining yields of 80, 40, and 50 centners per hectare, respectively, of corn, wheat, and rice compared with actual yields of 18, 12, and 23 centners per hectare in 1962. Although considerable increases in yields of these crops can be expected above the relatively low levels achieved in 1962, these envisioned yield responses are well above those achieved in the US, and it seems highly unlikely that the USSR will be able to surpass the yields obtained in 1959 in the major irrigated areas in the US -- 45, 21, and 38 centners per hectare, respectively, for corn, wheat, and rice -- by 1970. 52/ A US study indicates that a response of 50 percent was obtained from irrigated lands formerly producing dryland grain. (For an evaluation of the benefits that are likely to accrue to the USSR from the expansion of the area sown to grain on irrigated lands, see VI.*)

D. Mechanization

1. Planned Goals

There have been no announcements of an official comprehensive plan for the over-all mechanization of Soviet agriculture through 1970, and only a few preliminary estimates of the possible levels of production and delivery of equipment have been published. Supporting data for the official plans for 1964 and 1965 also were quite meager and did not include data on the value of production of agricultural machinery. Coverage of the period 1966-70 has been limited generally to a discussion of the "decisive" improvements in machinery and mechanization that are necessary or desirable. As expected, considerable

* P. 67, below.

attention has been given to the types of equipment required for the application of fertilizers, but quantitative data generally are lacking. In summary, the distinct impression is gained from the materials published on mechanization that much remains to be done in the formulation of concrete plans for production of agricultural machinery in the years ahead.

The major developments concerning the future mechanization of Soviet agriculture were outlined at the agricultural Plenum of February 1964 by A.A. Yezhevskiy, Chairman of the All-Union Agricultural Machinery Association. 53/ Yezhevskiy's speech, however, indicated only a hope for the solution by 1970 of all major problems of the past concerning Soviet agricultural mechanization. Subsequent reporting has served merely to emphasize the various points and proposals raised by Yezhevskiy. Achievement of the plan for 1970 for increasing the productivity of agricultural labor was stated to be dependent on the majority of the collective and state farms putting into practice the integrated mechanization and technology at present being applied by the leading equipment operators. Yezhevskiy stated that the chief directions for the development of technological progress in mechanization were higher powered tractors, higher operating speeds, equipment of wider working widths, and universal equipment adaptable to a variety of operations. An "unprecedented" speedup in creating and introducing these machines, based on the best examples of domestic and foreign machines, reportedly will be necessary. Yezhevskiy spoke also of the need to accelerate the introduction of integrated mechanization, to improve the quality of new production, to utilize the available machinery more effectively through improvements in the organization of work, to increase the number of qualified equipment operators, to increase production of spare parts and improve their quality, and to construct considerably more repair facilities.

As an example of the tasks lying ahead, Yezhevskiy reported that Soviet agriculture will require deliveries of more than 400,000 tractors annually in the period 1966-70 as well as numerous other machines to achieve the integrated mechanization of the basic branches of agricultural production. By comparison, deliveries of tractors averaged 222,000 annually in the period 1962-63 and are to average 270,000 annually in the period 1964-65. 54/ Agriculture received 72 to 73 percent of the Soviet production of tractors in 1962-63 compared with a planned receipt of 77 percent of production in 1964-65. 55/ In connection with the plan to increase the use of mineral fertilizers in agriculture, N.I. Strokin, Chairman of the State Committee for Tractors and Agricultural Machinery of the USSR Gosplan, has indicated that Soviet agriculture by 1970, even according to modest estimates, will require an inventory of some 700,000 fertilizing-type grain drills, 340,000 mineral fertilizer spreaders, and 300,000 loading and unloading machines for mineral fertilizers 56/ compared with a rather small current inventory of these types of equipment. General guidelines for future inventories of a number of the major types of equipment for

agriculture, without reference to year of achievement, were provided earlier by Premier Khrushchev at the Plenum of March 1962. These planned optimum inventories are presented in the following tabulation with comparative data for 1964 (in thousand units):

Type of Equipment	Planned Optimum Inventory*	Inventory as of 1 January 1964
Tractors	2,696	1,451
Trucks	1,650	916
Grain combines	845	533
Ensilage combines	257	198
Beet combines	257	52
Corn combines	111	50**
Tractor drills	1,628	1,089**
Tractor plows	1,180	830**
Tractor trailers	820	292***

2. Probable Achievements

Soviet agriculture is expected to have a considerably greater quantity of equipment available in 1970 than at present, and certain of the existing extremes in mechanization between various farm operations will have been leveled out. Tractors are expected to be more powerful, and field operations will be carried out at somewhat higher speeds. Wheeled tractors, having usurped the lead in new production from tracklaying models in 1962, will be used on a far wider scale in agriculture than at present. Many new and more efficient models of related tractor-powered equipment will have been introduced, including equipment for applying fertilizers. Some improvement in the general quality and maintenance of equipment probably will have been realized.

In spite of improvements in the mechanization of Soviet agriculture, there is little chance that the major problems emphasized by Yezhevskiy will have been solved by 1970. For example, annual deliveries of tractors to agriculture probably will average 10 to 15 percent less during 1966-70 than the number that Yezhevskiy indicated were required. It is entirely unrealistic, moreover, to suppose that the present level of achievement of the leading equipment operators will be typical of the average farm work in 1970.

* 57/
** As of 1 January 1963.
*** As of 1 January 1962.

Serious problems during the period 1966-70 in the supplying of equipment for the application of fertilizers appear to be unavoidable. The small current inventories of this equipment are composed mainly of outmoded equipment of low productivity. There were only about 24,000 grain drills of the fertilizing type (out of production since early 1961) available at the beginning of 1964 compared with modestly estimated requirements of some 700,000 in 1970. Soviet industry probably could not increase production of these drills to 230,000 to 250,000 units in 1969, as would be required to achieve an inventory of some 700,000 at the beginning of 1970, and continue to produce drills of the nonfertilizing type in the necessary quantities. The 1964-65 plan scheduled production of 232,000 grain drills of the nonfertilizing type and 130,000 of the fertilizing type. 58/ Because the improved designs are not yet ready, much of the output for the next few years will be composed of unsatisfactory models of current design, which will add to the difficulties of fertilizer application. Faulty distribution often leads to situations in which a fertilizer spreader is sent to one farm and the loader for use with it is sent to another farm. This kind of problem is not expected to disappear overnight.

Some improvement in the organization of farm work, the quality of machinery, the supply of spare parts, the construction of repair facilities, and the availability of qualified equipment operators is expected by 1970, but no real solution to all these problems will be forthcoming by that date. Some of these problems are the inheritance of decades of neglect and of ingrained habits that will require more than 6 or 7 years for their solution. It is expected that there will be as many complaints of poor use of machinery and over-long harvesting periods in 1970 as there are now and have been for years. The single task of providing equipment operators is a formidable one, even ignoring the factor of quality. It will require increasing the number of operators from about 2.8 million in 1963 to an estimated 6 million to 7 million by the early 1970's.

The USSR will have to expand its training program and train many more operators than the 2.6 million trained during 1957-62 if the number of equipment operators in 1970 is to be more than double the 2.8 million in 1963. One aspect of Khrushchev's educational reform of 1958 may contribute to a solution of this problem. Before the reform, many rural children left school after only 4 years, and for most rural children 7 years of schooling was the maximum. Currently, by contrast, such children are required to complete at least 8 years of formal schooling, with some technical training included in the curriculum. On reaching working age they should be easier to train as skilled equipment operators than was the case with previous generations. Training the requisite number of operators by 1970, however, will be no small task.

A more formidable task is to keep the operators on the farm. Between 1957 and 1962 the actual number of operators on the farm increased only 332,000 -- an increase equal to one-eighth of the

operators trained during the period. The USSR may provide additional incentives for equipment operators to stay on the farms or even resort to some restriction on the movement of operators off the farms in attempting to solve this serious problem. Higher wages would reduce the lure of the city for the equipment operators but would have to be accompanied by more goods for sale in rural areas. The imposition of restrictions on the movement of equipment operators would be counter to the general policy of relatively unrestricted movement of labor prevailing in the USSR in recent years and might be self-defeating because of a reluctance on the part of farm youth to participate in the operator training program under such restrictions. Thus, in spite of some improvement, the shortage of equipment operators is likely to continue to be a problem in 1970, particularly because the announced industrial goals suggest that Soviet industry's insatiable demand for skilled workers will continue.

E. Acquisition of Western Technology and Equipment

1. Impact on Agriculture

The role of imported knowledge and technology in the implementation of Soviet plans to expand agricultural production by 1970 cannot be minimized. The range of agricultural techniques, knowledge, and technology that the USSR could borrow with considerable economic benefit is great, but, judging from past Soviet practice, it depends on a number of different factors -- the incentive to utilize new technology, the knowledge of the borrowed technology, the need for it, and the skills and equipment needed to utilize or operate and maintain it.

In the past the USSR as one of the more newly industrialized nations borrowed heavily from the industrial West in the initial stages of the planned industrialization programs. A considerable effort has been made to keep Soviet scientists and engineers abreast of developments in Western countries by extensive procurement of Western technical and scientific literature. Following the development of their own agricultural machine building industry, for example, Soviet efforts have been directed toward the acquisition of prototypes that could be copied or modified to suit local conditions without having to pay the full price in terms of time and capital for research and development. In many instances, however, the USSR has experienced considerable difficulty in introducing new technology into agriculture.

Certain key elements seem to be involved in the ability of the USSR to borrow and apply knowledge in agriculture. One factor seems to be simplicity in production, operation, and maintenance. A second factor, which perhaps is the most important, seems to be the importance that Soviet leaders attach to certain knowledge and technology. Because of the nature of the Soviet administrative system, new technology can be introduced into Soviet agriculture and applied on a wide scale. The development of hybrid seed corn points up the

advantages of the Soviet system for acquiring and introducing new technology. Because the USSR was able to import inbred lines and US technology, it was able to switch from the use of open pollinated varieties of corn to the widespread use of hybrids in about 10 years, or in only one-half of the time required for the US as a whole.

On the other hand, it can be pointed out that the highly centralized decision-making process in the USSR at times can be disadvantageous in the introduction of new technology. Benefits that result from the use of new technology in certain regions are offset by its general application. For example, two-phase harvesting of grain, which has certain advantages under some conditions, has been introduced all over the USSR.

2. Impact on the Chemical Industry

The USSR in recent years has been a net exporter of fertilizer but a net importer of other agricultural chemicals. In spite of the inadequate supply of fertilizers for domestic use, relatively large quantities of fertilizers and fertilizer raw materials have been exported -- about 10 percent of the total production in 1962-63. Undoubtedly the supplying of Satellite countries and the need for foreign exchange dictated in part this seemingly irrational trade. Although there are indications that the USSR may import some types of fertilizers in the short run, Soviet long-range plans for production of fertilizers and allocations to agriculture imply that continuing exports are contemplated.

Soviet purchases of plants from the West for production of fertilizers or fertilizer raw materials have been quite significant in the past several years, amounting to some 20 installations. Since 1960 the estimated value of contracts concluded for such plants has amounted to approximately $200 million.* These purchases included facilities for production of urea (four plants), ammonium nitrate and ammonium sulfate, phosphatic fertilizers, and potash-mining equipment. The installations purchased for production of fertilizer raw materials or intermediates include five ammonia plants, four phosphoric acid plants, and a phosphorus plant. Major Western suppliers of fertilizer plants to the USSR have included the Netherlands, Belgium, France, West Germany, Italy, and the US.

The USSR will have to rely heavily on imported technology and equipment in order to produce the quantities of fertilizers and other agricultural chemicals planned for 1970. The European Satellites are expected to provide about one-third of the imports of equipment for this program. Soviet interest continues in importing fertilizer plants from its sources in Western Europe and also from Japan. Tentative estimates indicate that Soviet purchases from the industrial West

* Dollar values are given in current US dollars throughout this report.

of equipment for the manufacture of fertilizers and fertilizer raw materials could amount to some $400 million in 1964-70. In view of the recent pattern of Soviet imports and negotiations, it is clear that the USSR can obtain a considerable amount of fertilizer equipment and associated technology from Western Europe and Japan. Also, the USSR is interested in purchasing some very large fertilizer facilities from the US, including plants for production of high-nutrient superphosphate, complex fertilizers, ammonia, and potash-mining equipment.

The total Soviet imports of pesticides in 1962 amounted to about $15 million, more than 2.5 times the level in 1961, with the European Satellites providing about 70 percent of the imports. A further sharp rise in imports of pesticides occurred in 1963. In view of the continuing shortage of pesticides, however, the USSR also has been interested for some years in purchasing pesticide manufacturing equipment from the West. Soviet interest in purchasing pesticide plants from the US appears to be very strong, possibly because the US has patent rights for production processes for some of the more effective pesticides.

3. Financing the Imports of Western Technology and Equipment

Taken by itself, the estimated Soviet need to import about $400 million of plant and equipment from hard currency countries for the manufacture of fertilizers and fertilizer raw materials during 1964-70 would not require much adjustment in Soviet trade policies. Even when possible imports of fertilizers, pesticides, and other agricultural inputs are considered, the total amount could be managed with only moderate strain on the Soviet balance-of-payments position. These imports for the agricultural program, however, are only a small part of the probable Soviet requirements for imports from the industrial West during 1964-70. For example, it is estimated that the USSR will have to import about $2 billion in chemical machinery and equipment (including $400 million for fertilizer equipment) if the goals of the chemical program are to be approached, and potential imports of all machinery and equipment have been estimated at more than $8 billion for 1964-70 as a whole.

Past increases in imports of machinery and equipment have been permitted by a substantial volume of medium-term credits from Western suppliers and gold sales greater than current production. At present, new medium-term credits are almost entirely offset by payments of principal and interest on past credits at a time when the USSR must use scarce gold and currency reserves to pay for imports of grain.

It appears almost certain that the USSR must have longer term credits from the West to pay for the additional capital goods required for the chemical program. Soviet officials have been campaigning for long-term credits of up to 15 years in place of the usual

contract terms calling for repayment in 5 and 6 years for imports of machinery. The UK government has agreed to guarantee credit for up to 15 years for a maximum of $280 million in machinery and equipment for the USSR. One contract involving a $80 million polyester fiber complex has been signed and will carry a 15-year credit guarantee, 59/ but it is still uncertain whether or not the USSR will be successful in obtaining all the new credits needed to finance import requirements during 1964-70. To the extent that the desired credits do not become available, planned imports will have to be trimmed. In the process, planned imports of fertilizer and pesticide plants and equipment probably would be among the items cut, especially if the USSR is fortunate enough to have several good crop years in succession.

VI. Probable Levels of Production by 1970

A. Assumptions

All possible combinations of the factors of production provide in theory almost an infinite number of alternatives that can influence the future development of Soviet agriculture. The number of alternatives that can be or are likely to be adopted by the Soviet leadership, however, is restricted by the agricultural resource base of the USSR, by past developments in Soviet agriculture, and by the leaders being under some compulsion to strive toward goals established by them for agricultural production in 1970. Nevertheless, the number of alternatives still open to Soviet officials to influence agricultural development must be reduced further if an effective, meaningful analysis is to result. The assumptions listed below provide the frame of reference within which this study on prospects for Soviet agriculture in 1970 was conducted:

1. Soviet agriculture will not be disrupted by a major war during the period 1964-70.

2. The introduction of improved technology in Soviet agriculture will continue at a relatively slow pace as in the past except for increasing use of chemicals and the expansion of irrigation. Any new scientific or technological discoveries will not have a significant effect on the level or quality of agricultural output during the period.

3. The agricultural program followed throughout the period will be essentially the same as that outlined at or before the February 1964 Plenum, which placed emphasis on increasing the use of chemicals in agriculture and the expansion of irrigation -- that is, there will be no new crash programs of major importance.

4. The impact of better than average or worse than average growing conditions in 1970 on agricultural production will be equal to one standard deviation (plus or minus, respectively, which would equal about two-thirds of the estimated total deviation) in the average yields of the various crops and in the variations from the "least-squares" linear trend lines in output of the principal livestock products and in the number of livestock for the period 1953-63.

5. Any changes in the management or institutional structure of Soviet agriculture will not have a significant effect on agricultural production during the period.

6. The rate of growth of population in the USSR will be about 1.2 percent per year -- the rate estimated by the US Bureau of the Census.

7. The acreage pattern in 1970, with stipulated exceptions, will be roughly the same as that proposed in the study by P.M. Zemskiy, 60/ and the rates of fertilization will be proportional to those recommended in his study.*

8. The demand for agricultural products will be adequate to use any amounts produced up to the planned production goals -- that is, there will be no surpluses piling up in warehouses. This does not mean to imply, however, that the Soviet consumer will want to or be allowed to consume all commodities produced.

9. The handling and processing facilities for certain perishable commodities -- for example, milk, meat, and vegetables -- will expand at about the same rate as output of those commodities, and past trends in efficiency of operation will continue through 1970 -- that is, limitations in the capacity of these facilities will not have a significant restricting effect on output.

10. The price and incentive system will not be substantially altered from the present situation. This includes the assumption that there will be no substantial changes in price relationships among products.

11. As wheat supplies increase, the extraction rate will be lowered to 80 percent.

12. Per capita consumption of food in the USSR in 1970 will remain at about 3,200 calories per day.

13. The estimated production of livestock products in 1970 will be roughly in proportion to the goals for the various livestock products announced by Khrushchev on 9 December 1963.

B. Production of Crops

1. Crop Pattern

The natural conditions discussed in I** are expected to prevent any great increase in the total cultivated acreage in the USSR by 1970. During the intervening years, however, the cultivated acreage is expected to continue to expand slowly as in recent years. Thus it is estimated that a total of about 230 million hectares will be under cultivation in the USSR in 1970, an increase of only about 4 percent above the area under cultivation in November 1962 (see Table 34***).

* The comprehensive study by Zemskiy projects the future acreage, rates of fertilization, and yield responses of individual crops in each of 36 natural farming regions within the USSR. US specialists have judged Zemskiy's projections to be determined reasonably and intelligently. 61/

** P. 5, above.

*** Appendix A, p. 101, below.

The total sown acreage in the USSR in 1970, however, is expected to be about 4 percent less than that in the past several years. This reduction in sown acreage is expected to result from the USSR's being forced by 1970 to adopt a system of dry-land farming that will entail leaving substantial acreages fallow each year in the "new lands" and other semiarid areas (see Table 34, footnote b*). Thus it is estimated that the total sown acreage in the USSR will be 208 million hectares in 1970, a decrease of about 10 million hectares compared with that in 1963.

The impact of this reduction in the total sown acreage is expected to fall on the grain crops. It is estimated that the grain acreage in the USSR in 1970 will be about 125 million hectares, an area about 10 million hectares less than the average for 1962 and 1963. The acreage of potatoes and other vegetables as a group and that of the technical crops in 1970 are expected to be about one-seventh larger than the acreages planted to these crops in 1963, with these increases in acreage being accounted for through some reduction in the acreage of forage crops. The estimated distribution of the total sown acreage in 1970, by crops, is arrayed in Table 36.** These estimates generally conform to those projected by Zemskiy in 1959 (see assumption 7, above) except where Soviet cropping policy has changed since 1959 or is expected to change, as, for example, in the case of oats and sugar beets (see Table 35***).

2. Crop Yields per Hectare in 1970

The additional resources that apparently will be allocated to agriculture during the period 1964-70 are expected to result in sharp increases in the yields of most crops. In relation to the 1954-63 average the estimated increases by 1970 in yields of the crops covered by this report under the probable levels of fertilization range from a low of about 5 to 10 percent for sugar beets, cotton, and fiber flax to a high of about 40 percent for grains. The increases in yields for the other crops covered by this report -- potatoes, other vegetables, and sunflower seed -- are about 30 to 35 percent (see Table 17†). The increases in yields with somewhat higher or possible levels of fertilization range from a low of 10 percent for cotton and sugar beets to a high of 45 to 50 percent for grain and potatoes.

The expected increases in crop yields by 1970 are attributable to a number of factors. These factors include much heavier rates of application of chemical fertilizers, pesticides, and lime; an expansion in the acreage of crops grown under irrigation; the use of improved varieties of seed; an increase in the practice of fallowing;

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* Appendix A, p. 101, below.
** Appendix A, p. 103, below.
*** Appendix A, p. 102, below.
† P. 70, below.

Table 17

Estimated Yields per Hectare of Various Crops in the USSR
1954-63 Average and 1970

Crop	1954-63 Average (Centners per Hectare)	1970 a/			
		Probable		Possible	
		Estimate (Centners per Hectare)	Increase (Percent)	Estimate (Centners per Hectare)	Increase (Percent)
Grain b/	8.5	12	41	12.4	46
Potatoes	90	116	29	120	33
Other vegetables	101	135	34	150	49
Cotton	19.7	21.7	10	21.7	10
Sugar beets (for processing)	164	167	2	180	10
Sunflower seed	8.8	11.7	33	12.1	38
Fiber flax	2.5	2.8	12	3	20

a. Estimates of probable yields assume the use of 40 million tons of chemical fertilizers on crops, whereas possible yields assume the use of 47 million tons.
b. Including pulses and immature ears of corn converted to grain equivalents.

and other technological improvements. Grain is the only crop covered by this report in which the expected increase in the proportion of the crop grown under irrigation is sufficiently large for irrigation to have a significant impact on yields. It is estimated that the expected increase in the use of fallow, the better control of insects and weeds through the use of pesticides, the increased use of lime, and other technological advances such as improved varieties of seed are expected to result in increases in yields by 1970 of approximately one-tenth for most crops above the levels of yields obtained during 1953-63.

Most of the expected increases in crop yields by 1970 will be attributable to heavier rates of fertilization. After deducting 15 percent for losses, 2 to 3 percent for ineffective usage, and 3 million to 4 million tons for livestock feed,* it is estimated that, of the 51.8 million or 60.5 million tons of chemical fertilizers that are alternative estimates for the likely supply to agriculture in 1970 (see Table 16**), 40 million tons (probably) or 47 million tons (possibly) will be applied to crops. These levels of utilization of chemical fertilizers on crops would be more than three times as high as the 12.8 million tons estimated to have been applied to crops in 1963. (Losses, estimated at 20 percent, would have reduced the 16 million tons of chemical fertilizers supplied to agriculture in 1963 as given in Table 9*** by 3.2 million tons.) The estimated utilization of chemical fertilizers on crops in 1970 is presented in Table 18.†

The rate of application of chemical fertilizers to most crops by 1970 is expected to be much higher than that in recent years. Proportionately the largest increases in rates of fertilization are expected in those crops that have received relatively little fertilizer in the past -- grain, potatoes, and other vegetables. By 1960, cotton, sugar beets, and fiber flax already were being fertilized at about 60 to 90 percent of the recommended rate (see Table 19††).

Soviet officials appear to be somewhat optimistic with regard to the response in terms of crop production that can be expected from the use of chemical fertilizers. The estimated response of crops to chemical fertilizers in the USSR in 1970 averages about 80 percent of that expected by Soviet officials. For the USSR it is estimated that by 1970 the amount of agricultural produce that can be obtained through the application of a ton of chemical fertilizers will range from a low of one-fifth of a ton of fiber flax to a high of 10 tons of vegetables. Grain crops and potatoes are expected to yield

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* The USSR includes chemicals to be used as livestock feeds, such as urea, in its production figures for fertilizer.

** P. 55, above.

*** P. 26, above.

† P. 72, below.

†† P. 73, below.

Table 18

Estimated Utilization of Chemical Fertilizers in the USSR, by Crop a/ 1970

Million Metric Tons

Crop	1970 Probable	1970 Possible
Grain	18.8	22.5
Potatoes	3.8	4.6
Other vegetables	1.1	1.3
Cotton	3.0	3.0
Sugar beets (for processing)	2.5	3.0
Sunflower seed	0.26	0.3
Fiber flax	1.0	1.2
Other b/	9.55	11.1
Total c/	40.0	47.0

a. Computed using fertilization rates contained in Table 19 and data on acreage from Table 36 (Appendix A, p. 103, below).
b. Assuming that this category (which includes fodder crops, pastures, and orchards) will be a residual claimant in the allocation of fertilizer.
c. Fertilizer allocated to agriculture as in Table 16 (p. 55, above) less that for use as livestock feed, reduced by 17 to 18 percent to exclude estimated wastage and ineffective utilization.

a response of 1.3 tons of grain and 8 tons of potatoes, respectively, per ton of fertilizer used (see Table 20*).

3. Crop Production in 1970

Probable production of grain in the USSR in 1970 is estimated at 150 million tons (see Table 21**), an increase of almost 40 percent above the 1958-63 average but only 20 percent larger than the excellent harvest in 1958. Approximately one-half of the increase in production of grain is expected to result from increased use of chemical fertilizers and about one-seventh from an expansion in the acreage of grain grown under irrigation. The remaining one-third of the increase in production of grain is expected to accrue from other

* P. 74, below.
** P. 75, below.

Table 19

Estimated Rates of Chemical Fertilization
in the USSR, by Crop
1960 and 1970

Kilograms per Hectare

Crop	1960 a/	1970		
		Recommended b/	Estimated	
			Probable c/	Possible d/
Grain	15	200	150	180
Potatoes	95	540	400	480
Other vegetables	140	720	540	650
Cotton	900	1,010	1,010	1,010
Sugar beets (for processing)	660	740	560	670
Sunflower seed	N.A.	62 e/	50	60
Fiber flax	440	760	570	680

a. Computed from official allocation and acreage figures and reduced by a waste factor of 20 percent. 62/

b. Calculated from data in source 63/ and converted from a nutrient basis to Soviet standard fertilizer units to make the data compatible with the 1960 data.

c. Based on the following assumptions:

(1) Cotton -- assumed "recommended" rate of fertilization. By 1960, cotton already had received 90 percent of the recommended rate.

(2) Grain, potatoes, other vegetables, sugar beets, sunflower seed, and fiber flax -- assuming that these crops will receive three-fourths of the recommended rate. For these crops, except sugar beets, the estimated rate for 1970 will be substantially higher than the rate applied in 1960. A reduced rate for sugar beets is projected because it is estimated that the acreage planted to sugar beets in 1970 will be 40 percent larger than that projected by Zemskiy for his recommended rates.

d. In the "possible" estimate, cotton was given the recommended rate. Rates for all other crops were increased by 20 percent above the probable level.

e. 64/

Table 20

Response of Crops to Fertilization Claimed by Soviet Officials and Estimated Response for 1970 a/

Metric Tons

Crop	K. Obolenskiy b/	N. Baranov c/	V. Dmitriyev d/	P. Bobrovskiy e/	Estimated Response for 1970
Grain	1.5 f/	1.8 g/	1.5 to 2	1.4	1.3
Potatoes	11.5	8.6	N.A.	10.9	8
Other vegetables	10.6	N.A.	N.A.	N.A.	10
Cotton	1	0.9	0.8 to 1	0.9	1
Sugar beets (for processing)	8.4	8.8	7.5 to 10	7.3	7
Sunflower seed	4.8	5.7	N.A.	N.A.	4 to 5
Fiber flax	0.27	0.33	N.A.	0.2	0.2

a. Expressed as additional units of output per unit of fertilizer input.
b. 65/
c. 66/
d. 67/
e. 68/
f. Winter wheat and mature corn only.
g. Winter wheat only.

Table 21

Estimated Crop Production in the USSR
1958-63 Average and 1970

Million Metric Tons

Crop	1958-63 Average	1970 Probable a/	1970 Possible b/
Grain	108.3	150	155
Potatoes	81.1	110	115
Other vegetables	15.6	27	30
Cotton	4.6	6.5	6.5
Sugar beets (for processing)	49.8	75	80
Sunflower seed	3.9	6.2	6.4
Fiber flax	0.4	0.5	0.54

a. Levels of production with the use of 40 million tons of chemical fertilizers.
b. Levels of production with the use of 47 million tons of chemical fertilizers.

technological improvements, such as improved mechanization and increased use of lime (in the northern European USSR).

Probable production of potatoes and other vegetables in 1970 is estimated at 110 million tons and 27 million tons, respectively. These levels of output represent increases of about 35 percent for potatoes and almost 75 percent for other vegetables above average production during 1958-63. The increase in production of potatoes is largely attributable to the expected increase in the use of chemical fertilizers. On the other hand, the increase in production of other vegetables is attributable about equally to the increased use of chemical fertilizers and to an expansion, estimated at about one-third, in the acreage planted to vegetables. Production of both potatoes and other vegetables is expected to benefit from other improvements, particularly from increased applications of lime.

Production of technical crops in the USSR is expected to increased sharply by 1970. It is estimated that production of cotton will reach 6.5 million tons, an increase of more than two-fifths above the average level of output during 1958-63 but only about one-fourth larger than the record crop of 1963. The probable production of sugar beets, estimated at 75 million tons in 1970, will be about one-half larger than the average amount of beets produced during 1958-63. The

increases in production of both cotton and sugar beets are expected to accrue largely from an expansion in acreage rather than an over-all increase in yields.

The probable production of sunflower seed and fiber flax in 1970 is estimated at 6.2 and 0.5 million tons, respectively. Thus production of sunflower seed is expected to increase by almost three-fifths and that of fiber flax by one-fourth in relation to the average levels of output during 1958-63. Almost half of the increase in production of these commodities is expected to result from an expansion in acreage, with the remainder being attributable to heavier fertilization and expected improvements in technology.

The levels of crop production achieved in 1970 may be somewhat higher than those discussed above that assume the utilization of 40 million tons of chemical fertilizers on crops. It is possible that a total of 47 million tons of chemical fertilizers will be applied to crops in 1970. It is estimated that the additional fertilizers would provide the following increments (in million tons) to the probable levels of production discussed above:

Grain	5	Sugar beets (for processing)	5
Potatoes	5	Sunflower seed	0.2
Other vegetables	3	Fiber flax	0.04

Weather conditions in the USSR are expected to have a greater impact on the levels of crop production in 1970 than the variation in utilization of chemical fertilizers discussed above. The impact of better or worse than average weather on crops in 1970 in compliance with assumption 4* is estimated to be equal to one standard deviation plus or minus, respectively, in yields. The use of one standard deviation, which encompasses about two-thirds of the estimated total deviation in yields, in estimating the effect of weather on crop production is believed to be justified because variations in weather do not have the same effect on the yields of the various crops. The procedure used in estimating the standard deviation of the yield for each crop in 1970 was as follows: a standard deviation of the yields of each crop was calculated for the period 1953-63 and was related to the average 1953-63 yield in arriving at a coefficient of variation, and this coefficient of variation was then applied to the estimated yield of the crop under average weather conditions in 1970. The resulting standard deviations in crop yields in 1970 are given in Table 22.

The estimated variations in crop production in 1970 resulting from differences in weather conditions range from a low of about

* P. 67, above.

Table 22

Estimated Crop Production in the USSR Under Varying Weather Conditions
1970

Crop	Sown Area a/ (Million Hectares)	Average Weather		Standard Deviation of Yield (Centners per Hectare)	Worse Than Average Weather		Better Than Average Weather	
		Yield b/ (Centners per Hectare)	Production b/ (Million Metric Tons)		Yield (Centners per Hectare)	Production (Million Metric Tons)	Yield (Centners per Hectare)	Production (Million Metric Tons)
Grain	125	12	150	1	11	138	13	162
Potatoes	9.5	116	110	9	107	102	125	119
Other vegetables	2	135	27	14	121	24	149	30
Cotton	3	21.7	6.5	1.2	20.5	6.2	22.9	6.9
Sugar beets (for processing)	4.5	167	75	28	139	63	195	88
Sunflower seed	5.3	11.7	6.2	2.3	9.4	5.0	14.0	7.4
Fiber flax	1.8	2.8	0.5	0.5	2.3	0.4	3.3	0.6

a. For procedures used in estimating the total sown area in 1970, see Table 34 (Appendix A, p. 101, below), and for estimated distribution of the total sown area in 1970, by crop, see Table 35 (Appendix A, p. 102, below).
b. See Tables 17 and 21 (pp. 70 and 75, respectively, above).

10 percent for cotton to a high of about 40 percent for sunflower seed and fiber flax. The effect of weather on production of cotton is relatively small because cotton is grown under irrigation. The variation in production of grain due to worse or better than average weather conditions is estimated at about 140 million to 160 million tons (see Table 22*). The expected variation due to weather is from about 100 million to 120 million tons for potatoes and from 25 million to 30 million tons for vegetables.

C. Livestock Industry in 1970

1. Feed Supply

The total amount of feed available in 1970 in the USSR is expected to be about 30 percent larger than the average of about 200 million tons available during 1958-62 (see Table 23). An increase in the estimated availability of concentrated feeds accounts for about 70 percent of the total increase in availability of feed. This increase in the availability of concentrated feeds is primarily attributable to a much larger amount of grain and millfeed being available for livestock feed as a result of the estimated increase in production of grain by 1970.

Table 23

Estimated Net Availability of Feed Units in the USSR a/
1958-62 Average and 1970

Million Metric Tons

Type of Feed	1958-62 Average b/	1970 Probable	1970 Possible
Concentrated	47.0	87.3	88.9
Succulent	41.0	55.2	59.1
Coarse	51.5	52.7	56.3
Pasture	61.3 c/	60.8	62.8
Total	200.8	256.0	267.1

a. Feed units are in terms of 1 ton of oat grain.
b. See Table 47 (Appendix A, p. 114, below).
c. Feed from pasture in 1958 was reduced. See Table 24, footnote f (p. 80, below).

* P. 77, above.

The increase in the estimated amount of succulent feeds produced in 1970 accounts for most of the remaining increase in total availability of livestock feeds. This increase in succulent feeds is attributable primarily to the estimated increase in the availability of potatoes for livestock feed and to the estimated increases in production of sugar beets for feed, silage, and crops used as green feed. It is estimated that almost twice as many potatoes and sugar beets will be available for feed in 1970 as during the period 1958-62. The increase in production of succulent feeds in 1970 is attributable primarily to increased yields resulting from heavier rates of application of chemical fertilizers on these crops.

Relatively little increase is estimated in the availability of coarse feeds -- hay and straw -- and pasture. The expansion in the total cultivated acreage in the USSR, discussed earlier in this section of the report,* is expected to result in a slight decline in the total area of natural hay land and pasture. Because there is not expected to be much increase in the use of chemical fertilizers on natural hay land and pasture, the effect on production of any resulting increase in yields per hectare is expected to be largely offset by the reduction in the total area under these crops.

2. Projection of Soviet Feed-Livestock Production Ratios

The Soviet feed-livestock ratios, which were obtained by increasing the Soviet "norms" of feed required per unit of livestock product by 10 percent, provide a consistent description of the relationship between the annual availability of feed and the annual production of livestock products, animal draft power, and increase in livestock inventories during the 1954-63 period (see Table 24**).

The total feed-livestock production ratios of the 1953-63 period are assumed to be a fairly good approximation of the feed-livestock production ratios that will exist in the USSR in 1970. Some changes in feeding efficiency are no doubt occurring in the USSR. However, changes in feeding efficiency occur relatively slowly. In the US the reduction in total feed units required per unit of livestock product has been less than might be expected. In the US the reduction in total feed units per unit of livestock product from 1910 to 1959 is only as follows: milk, 12 percent; hogs, 14 percent; beef cattle, 4 percent; and eggs and poultry (other than broilers and turkeys), no change. 69/

Changes in Soviet feeding practices, however, will occur by 1970 in conformance with the changes in the composition of the Soviet

* P. 68, above.
** P. 80, below.

Table 24

Estimated Net Availability and Utilization of Feed Units in the USSR a/
1953-63 and 1970

Million Metric Tons

Year	Total Availability c/	Utilization b/				
		Production of Meat d/	Production of Milk	Production of Eggs	Horse Feed	Total e/
1953	N.A.	67.2	38.2	3.5	38.2	147.1
1954	140.7	67.3	39.9	3.8	38.2	149.2
1955	155.1	76.3	44.9	4.1	35.5	160.8
1956	174.2	80.6	51.3	4.3	32.5	168.7
1957	181.2	91.7	56.5	4.9	31.0	184.1
1958	200.0 f/	98.0	60.1	5.1	29.8	193.0
1959	206.0	105.1	61.7	5.6	28.8	201.2
1960	200.1	99.2	61.0	6.0	27.5	193.7
1961	194.5	105.6	61.9	6.4	24.8	198.7
1962	203.5	110.8	63.9	6.6	23.5	204.8
1963	179.7	95.5	61.9	6.3	22.8	186.5
1970 (probable)	256.0	155.3	77.0	8.4	15.3	256.0
1970 (possible)	267.1	163.7	79.5	8.6	15.3	267.1

a. Feed units are in terms of 1 ton of oat grain.
b. The following feed ratios were used in calculating utilization: 12.13 tons of feed units per ton of slaughter weight meat, 1.1 tons of feed units per ton of milk, 220 tons of feed units per million eggs, and 2.5 tons of feed units per horse.
c. See Table 47 (Appendix A, p. 114, below).
d. Including changes in the size of herds converted to slaughter weight meat equivalent.
e. Differences between the estimated total availability of feed units and the estimated total utilization are believed to be attributable primarily to changes in the amount of feed carried over from one year to the next.
f. Availability of feed was reduced by 39.4 million tons because the amount of feed produced on pastures in 1958 was sufficiently in excess of average that existing livestock herds could not have consumed more than about two-thirds of the grass.

feed supply. The percent of estimated total available feed units supplied by the several types of feeds in the 1954-63 period and in 1970 are as follows:

	Total Feed Units Available (Percent)		
		1970	
Type of Feed	1954-63 Average	Probable	Possible
Concentrated	23.4	34.1	33.3
Succulent	16.8	21.6	22.1
Coarse	26.0	20.6	21.1
Pasture	33.8	23.7	23.5
Total	100.0	100.0	100.0

Thus concentrated feeds and succulent feeds will supply greater proportions of total feed supply in 1970 than they did in 1954-63. In this decade the available concentrates were somewhat less than the requirements indicated by the Soviet feeding norms, implying that potatoes and root crops in the succulent feeds group were substituted for a part of the grain needs. In 1970, concentrated feeds and succulent feeds will be increasingly used in the place of some of the coarse feeds and pasture that are not expected to increase as rapidly. This substitution of concentrated feeds for the other feeds poses no problem in feeding practice, although the reverse practice, which has been the Soviet tendency in the past, is much more difficult. In the US the relationship of concentrates to total livestock feed fed per unit of livestock production has remained fairly constant at about 40 percent from 1910 to the present.

3. Production of Livestock Products in 1970

The feed-livestock production ratios in this report* were used in conjunction with the estimated total availability of feed in arriving at estimates of production of the principal livestock products in 1970. The utilization of the estimated total availability of feed in production of the various livestock products is shown in Table 24. The level of availability of feed estimated for 1970 under probable fertilizer usage and average weather will permit substantial increases in production of the principal livestock products. Production of meat is expected to increase sharply by 1970 and to reach a level estimated at 11.5 million tons (see Table 25**), an increase of about 40 percent

* See III, C, 5, p. 40, above.
** P. 82, below.

Table 25

Estimated Production of Livestock Products in the USSR
1962 and 1970

Million Metric Tons a/

Livestock Product	1962	1970 Probable	1970 Possible
Meat	8.14	11.5	11.7
Milk	58.1	70	72.4
Wool	0.371	0.45	0.46
Eggs (billion units)	30.1	38	39

a. Unless otherwise indicated.

above that estimated in 1962.* More modest increases are projected for the other livestock products. Production of milk and wool in 1970 is estimated at 70 million tons and 450,000 tons, respectively, an increase above 1962 of about one-fifth for both milk and wool. Output of eggs in 1970, estimated at 38 billion units, is expected to be about one-fourth larger than in 1962.

The levels of output of livestock products achieved in 1970 may be somewhat higher than those discussed above if a somewhat greater amount of fertilizer is utilized on crops in 1970. The resulting increase in the availability of feed would permit an additional increase of 2 to 4 percent in production of livestock products (see Table 25).

The effect of variations in weather on feed supply is expected to have a significant impact on the level of performance of the livestock industry in the USSR in 1970. As in the case of crops, the standard deviation was used as the statistical device in estimating the impact of variations in weather on animal husbandry. A standard deviation around the "least-squares" linear trend line was calculated for the period 1953-63 for production of each livestock product and for the herds of each class of livestock. These standard deviations then were related to the average (1953-63) production of each livestock product and the average size of herds of each class of livestock to obtain coefficients of variation. These coefficients of variation were applied to the probable level of performance of the Soviet livestock industry in 1970 in estimating the

* 1962 is used in this report as the base year for livestock products because 1963 was an abnormal year in the USSR for production of these products.

standard deviations in production of livestock products and in the size of herds in 1970. (The estimated impact of variations in weather on the performance of the Soviet livestock industry in 1970 is shown in Table 26.*)

4. Number of Livestock

During 1960-63, there was a downward trend in production per head of livestock** because the USSR attempted to overwinter too large a herd in relation to the feed supply. In estimating the number of livestock on 1 January 1970, it is assumed that the downward trend in productivity per head will be halted and that the ratio of livestock to livestock product will recover by 1970 to about the level of 1960. Although currently somewhat more attention is being given to achieving the proper relationships between the number of livestock and the supply of feed, there are several factors that are expected to minimize gains in productivity per head. It will be difficult for Soviet officials to abandon the practice of using the size of herds as an indicator of success in animal husbandry. As in the past, Soviet officials can be expected to continue to agitate for increases in livestock herds in anticipation of the achievement of a larger than actual fulfillment of planned increases in feed supplies. In view of the fact that production of feed in 1970 is expected to fall far short of the planned goals, a continuation of the emphasis on the size of herds is expected to result in livestock herds in 1970 that continue to be perhaps somewhat too large for most efficient utilization of the available feed. Also, the incidence of improper utilization of feed additives -- a new technology in the USSR -- is expected to be sufficient in 1970 to offset much of the gain that would be expected to accrue from their use.

The estimated production of livestock products in 1970 will require much larger herds of livestock than those existing in the USSR in recent years. The number of cattle is expected to continue to increase and to reach an estimated 110 million in 1970, an increase of about one-third above the size of the herd at the beginning of 1962 (see Table 45***). The number of hogs and cows is expected to be about 83 million and 43 million, respectively, in 1970, both about 20 to 25 percent larger than in 1962. The number of sheep is estimated at 160 million, or an increase of about one-sixth. The number of horses and goats, however, is expected to continue to decline. The estimated decrease by 1970 of one-third in the number of horses will be due primarily to a further increase in the use of mechanical draft power.

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* P. 84, below.

** Calculated by dividing the annual production of each livestock product by the number of producing livestock units on 1 January of that year.

*** Appendix A, p. 112, below.

Table 26

Estimated Production of Livestock Under Varying Weather Conditions in the USSR
1970

Item	Unit	Average Weather	Standard Deviation	Worse Than Average Weather	Better Than Average Weather
Livestock product					
Meat	Million metric tons	11.5	0.4	11.1	11.9
Milk	Million metric tons	70	4.6	65.4	74.6
Wool	Million metric tons	0.45	0.018	0.432	0.468
Eggs	Billion units	38	1.5	36.5	39.5
Size of livestock herd a/					
Cattle	Million head	114.7	3.9	110.8	118.6
Hogs	Million head	90.5	5.2	85.3	95.7
Sheep and goats	Million head	168.8	5.1	163.7	173.9
Change in number of livestock during 1970					
Cattle	Million head	4.7		0.8	8.6
Hogs	Million head	7.3		2.1	12.5
Sheep and goats	Million head	4.8		-0.3	9.9

a. As of 1 January 1971 except for the column containing standard deviations. The size of the livestock herd as of 1 January 1970 is estimated as follows (in million head):

Cattle	110
Hogs	83.2
Sheep and goats	164

D. Net Agricultural Production in 1970

1. Index of Production

Net agricultural production in the USSR in 1970, with probable fertilizer usage and average weather conditions, is expected to be somewhat more than one-third above the average level of production at which Soviet agriculture had stagnated during the period 1958-63 (see Table 27). The estimated probable level of net agricultural production in 1970 will require an average annual increase above the average level of 1958-63 of almost 5 percent during 1964-70. The expected increase in net agricultural production from the average level of 1958-63 to 1970 is somewhat below that attained from 1953 to the average level of 1958-63.

Table 27

Estimated Index
of Net Agricultural Production
in the USSR a/
1958-63 and 1970

1958-63 = 100

Year	Index	Year	Index
1958	100	1970	137 b/
1959	96	1970	143 c/
1960	97	1970	124 d/
1961	105	1970	151 e/
1962	104		
1963	98		

a. The values of agricultural production used in calculating the index were obtained from Tables 60 and 63 (Appendix B, pp. 129 and 133, respectively, below).
b. With probable fertilizer usage and average weather.
c. With possible fertilizer usage and average weather.
d. With probable fertilizer usage and worse than average weather.
e. With probable fertilizer usage and better than average weather.

The level of net agricultural production that the USSR will achieve in 1970 is dependent in large measure on weather conditions and the amount of fertilizer actually used. Under average weather conditions the larger amount or possible fertilizer usage estimated in this report would result in an estimated level of net agricultural output in 1970 about 5 percent higher than that achieved with the estimated probable use of chemical fertilizers. The impact of variations in weather in 1970 on agricultural production in the USSR will be much greater than that resulting from the variations in fertilizer usage estimated in this report. Under worse than average weather with probable fertilizer usage, net agricultural output in the USSR in 1970 is expected to exceed the average level of 1958-63 by only about one-fourth, but with better than average weather with probable fertilizer usage net production would be expected to surpass the average level of 1958-63 by one-half.

The methodology used in computing the indexes of net agricultural output for 1970 is the same as that described in III, A.* The components used in calculating the estimated value of agricultural output in 1970 are presented in Table 63.** The basic state procurement prices published on 1 July 1958 were used to weight the physical components in the indexes.

2. Increase Attributable to Crops

Production of crops will account for more than 60 percent of the estimated increment to net agricultural output between the average for 1958-63 and 1970 (see Table 28). The increase in production of grain is expected to account for almost one-half of the total increase in the value of crop production. The remainder of the increase in the value of crop production is divided about equally between potatoes and other vegetables as a group and the technical crops.

3. Increase Attributable to Animal Husbandry

Output of the Soviet livestock industry in 1970 is expected to account for the remaining 40 percent of the estimated increment to net agricultural production. Increases in production of livestock products are expected to account for about 90 percent of the total increase in the value of output of the livestock industry, with the value of increases in herds in 1970 accounting for the remainder.

* P. 29, above.
** Appendix B, p. 133, below.

Table 28

Estimated Net Agricultural Production in the USSR
1958-63 and 1970

Billion Rubles

Item	Average 1958-63 a/	1970 b/	Increment in 1970 Above the Average for 1958-63
Grain	6.21	9.34	3.13
Potatoes	2.57	3.68	1.11
Other vegetables	1.09	1.89	0.80
Technical crops	4.23	6.07	1.84
Subtotal	14.10	20.98	6.88
Livestock products	14.72 c/	18.37	3.65
Number of livestock	0.86 c/	1.33	0.47
Subtotal	15.58	19.70	4.12
Total	29.68	40.68	11.00

a. Unless otherwise indicated, the average value of agricultural production was calculated from data in Table 60 (Appendix B, p. 129, below).
b. Values were obtained from Table 63, column 6 (Appendix B, p. 133, below).
c. Data for 1963 were obtained from Table 60, footnote b.

VII. Implications of Estimated Agricultural Production in 1970

The estimated increase in net agricultural production in the USSR by 1970 under average weather conditions and probable fertilizer usage (discussed in VI*) is only about one-fourth of the goal established for 1970 in the Twenty Year Plan (1961-80). However, in view of the fact that the Soviet leaders have failed to achieve planned goals for increases in agricultural production in the past, the underfulfillment of the goal for 1970 is not expected to cause serious problems for the leadership. The significant progress that the Soviet leaders are expected to make in increasing net agricultural production by 1970 will have certain domestic and international implications.

A. Domestic

1. Rate of Economic Growth

In the 1960-62 period, agriculture accounted for slightly less than one-third of Soviet GNP. In 1963, however, the share of agriculture in GNP fell to about 29 percent. In that year a crop failure resulted in a decline of 5 percent in net agricultural production, which was a significant factor depressing the growth of GNP to an estimated 2 percent. Under probable weather conditions the rate of growth in agriculture during 1964-70 will have a significant impact on the growth of GNP. Although the share of GNP provided by agriculture will continue to decline and by 1970 will be well below that of the 1960-62 period, agriculture will still have a much greater influence on the over-all performance of the Soviet economy than on the economies of other industrialized countries. The effect of variations in agricultural production on growth in GNP is shown in the following tabulation (this calculation of GNP assumes that industrial production during 1964-70 will continue to increase at about 7 percent annually and that the increase in the other nonagricultural sectors will continue at about 5 percent):

Variations in Production	Estimated Value of Net Agricultural Production in 1970 (Billion Rubles)	Average Annual Rate of Growth 1964-70 (Percent)	
		Agriculture	GNP
Probable**	40.68	4.9	5.7
Possible***	42.54	5.5	5.9
Possible†	36.72	3.3	5.3
Possible††	44.69	6.3	6.1

* P. 67, above.
** With probable fertilizer usage and average weather.
*** With possible fertilizer usage and average weather.
† With probable fertilizer usage and worse than average weather.
†† With probable fertilizer usage and better than average weather.

There are, of course, alternative uses for agricultural commodities. It is expected that the increased output of agricultural products by 1970 will be used primarily to improve the standard of living of the Soviet people. However, the reserves of some commodities, especially grain, which is storable, will be built up, and some expansion in exports probably can be expected.

2. Food Supply and Diet

The increased supply of foodstuffs in 1970 will bring about some qualitative improvement in the Soviet diet, which was one of Khrushchev's important aims toward improving the well-being of the Soviet people. As seen in Table 29, potatoes and cereal products will predominate at the dinner table, with almost half of the estimated daily caloric intake of 3,200 calories being supplied by these two categories. Correspondingly the intake of quality foods (meat, milk, vegetables, and fruits) will have increased to more respectable levels for good nutrition. It is estimated that the annual consumption of meat (including edible slaughter fats) and milk per capita by 1970 will be about 45 and 260 kilograms (see Table 65*), respectively, compared with about 35 and 235 kilograms available in 1961-62 (see Table 14**). These levels of meat and milk consumption, however, are far short of the 90 to 100 kilograms of meat and about 465 kilograms of milk that Khrushchev had hoped to provide by 1970. 70/

Although the improvement most certainly will be welcomed by the consumer, the Soviet diet will continue to lack the variety and qualitative composition of the advanced Western countries. For example, consumption of meat under the best conditions will lag behind such industrialized countries of Western Europe as the UK, West Germany, and France, to say nothing of the US, which has an annual per capita consumption of about 100 kilograms. On the other hand, the probable level of milk consumption in all forms in 1970 will almost equal the current level of the US, but it would still be considerably below that of the UK, West Germany, and France. Furthermore, it does not seem likely that the sharp seasonal variations in the supply of some products, especially fresh milk, fruits, and vegetables, which have characterized the food supply in the USSR, will be decreased appreciably by 1970. It should be pointed out that the quality of cereal products, especially bread, as well as assortment and packaging, probably will show some improvement.

Because of the alternative nonfood uses for some products -- vegetable oil in paints and varnishes and grain and potatoes for industrial alcohol -- a considerable quantity of these foodstuffs is diverted into industry because of the lack of synthetic substitutes. At present, more than 700,000 tons of vegetable oil and an estimated total of 3 million tons of grain are used annually in the production of nonfood products.

* Appendix B, p. 136, below.
** P. 45, above.

Table 29

Estimated Daily Consumption of Food Per Capita in the USSR
1961-62 Average and 1970

Food Products	1961-62 Average		Availability of Food in 1970							
			Probable [a]		Possible					
					A [b]		B [c]		C [d]	
	Calories [e]	Percent of Total	Calories	Percent of Total	Calories	Percent of Total	Calories	Percent of Total	Calories	Percent of Total
Meat (net of slaughter fats)	167	5.2	222	6.9	224	7.0	211	6.6	227	7.1
Edible slaughter fats	63	2.0	101	3.2	101	3.2	96	3.0	104	3.3
Milk	385	12.0	427	13.3	444	13.9	395	12.3	460	14.4
Fish	15	0.5	19	0.6	19	0.6	19	0.6	19	0.6
Sugar	288	9.0	381	11.9	400	12.5	342	10.7	400	12.5
Potatoes	254	7.9	230	7.2	230	7.2	230	7.2	230	7.2
Other vegetables	43	1.3	63	2.0	68	2.1	58	1.8	68	2.1
Vegetable oil	133	4.2	241	7.5	241	7.5	195	6.1	241	7.5
Flour	1,695	53.0	1,356	42.4	1,312	41.0	1,496	46.8	1,290	40.3
Others	157	4.9	160	5.0	161	5.0	158	4.9	161	5.0
Total	3,200	100.0	3,200	100.0	3,200	100.0	3,200	100.0	3,200	100.0

a. With probable fertilizer usage and average weather.
b. With possible fertilizer usage and average weather.
c. With probable fertilizer usage and worse than average weather.
d. With probable fertilizer usage and better than average weather.
e. See Table 14 (p. 45, above).

Although Soviet efforts during 1954-63 to decrease the use of food products for such purposes have not been very successful, expansion of the chemical industry during the next 5 or 6 years should result in a reduction in the nonfood use of food raw materials. Diversion of these foodstuffs for use as food or feed (in the case of grain) would permit some additional improvement in the diet.

B. International

Along with improvement of the domestic food situation, part of the additional production to be realized in the USSR by 1970 will be placed in state reserves or will be exported. Although little is known about Soviet grain reserves, the disastrous wheat crop of 1963 exposed a weakness in the reserves of that commodity hitherto underestimated in the Western world. Because of the reaction of Soviet leaders to the grain crisis in 1963 and the high priority being given to building up state reserves, the possibility of a comparable situation developing in the future does not appear to be likely.

At the Supreme Soviet in July 1964, Khrushchev spoke of the need to establish "necessary grain reserves": "Not less than half or even the full annual requirement of bread grains [wheat and rye] is needed in order to be protected against any eventuality." Although "requirements" are not known, protection against "any eventuality" would eliminate the need ever again to import wheat from the Western nations on the scale of July 1963 - June 1964 because of the 1963 crop failure.

1. Implications for the European Satellites

In the European Satellites, because of the lack of adequate investment and incentives, agricultural programs have not been successful, and stagnation has characterized agriculture in most of these countries. Although agriculture currently is being given more emphasis in order to stimulate production, it does not seem likely that the agricultural problems of the Satellites will be solved by 1970.

The USSR, because of political and economic considerations, will continue to be an important supplier of agricultural commodities, especially grain, to the European Satellites. By 1970, however, it may no longer be the case that the greater part, by far, of Soviet agricultural exports (chiefly grain) will continue to be oriented toward the Satellites. By 1970 it is estimated that the USSR should have some 10 million to 11 million tons of grain, primarily wheat, available for export or for state reserves. This quantity of grain would be more than sufficient to meet the estimated net import requirements of the European Satellites of 6 million tons by 1970. It is doubtful, however, that the USSR would be willing to satisfy all the requirements of the Satellites. Given the need to build up state reserves and to earn foreign exchange to pay for growing imports of capital goods from the West, the USSR probably will export no more than 3 million to 4 million tons of grain

to the Satellites and try to expand exports to the West. Also, because of the shortage of feed grains in the USSR and the vast requirements of the Soviet livestock industry, requirements for feed grains to implement domestic livestock programs probably cannot be fully met by the USSR. The Satellites, therefore, will have to depend for the remainder of their requirements on domestic output, which they are trying to expand, and on imports from the Free World.

The USSR exports some meat, cotton, and vegetable oil or oilseeds to the European Satellites. These exports, however, have been generally at the expense of domestic consumption. In the past the USSR has been a significant importer of sugar from the Satellites. Expanded domestic production of this commodity together with the continued import of a substantial quantity from Cuba would eliminate the need for importing sugar from the Satellites. At the same time, the Satellites are attempting to expand exports of sugar to the Western countries because of the need for hard currency.

2. Implications for the US

In order to help finance the high level of imports of capital goods for Soviet industrialization programs and particularly the plants and equipment needed to develop the chemical industry, the USSR undoubtedly will attempt to expand exports of agricultural commodities to Western Europe, where much of the capital equipment will be purchased.

Western Europe is a principal market for US agricultural products, especially wheat, cotton, and oilseeds. With the increased production of these commodities, it can be expected that the USSR will make a determined effort to market more of these commodities, especially wheat, for hard currency. Because Western Europe is a prime hard currency area and will be the major supplier of chemical plants and equipment to be purchased by the USSR, the USSR probably will try to expand agricultural exports to Western Europe. Thus increasing competition from the USSR in Western Europe is a definite possibility in 1964-70.

3. Implications for the Less Developed Countries

Soviet exports of agricultural products to the less developed countries probably will remain at a fairly low level, primarily because the less developed countries generally are exporters of agricultural products and importers of industrial or manufactured goods. Selected exports motivated by political considerations undoubtedly will take place even at the expense of domestic consumption if necessary, but their aggregate significance is not expected to be great.

The most important agricultural commodities imported from the less developed countries include cotton, rice, and natural rubber.* Soviet import requirements for these commodities probably will be affected to some extent by the expanded domestic production of cotton, synthetic fiber, rice, and synthetic rubber. However, several important considerations, financial, economic and political, probably will weigh heavily in Soviet decisions concerning the imports of these commodities.

Egypt, Syria, Sudan, and Afghanistan are the most important suppliers of cotton, with Egypt providing about 45 percent of total imports of cotton in 1962 and 1963. Egyptian long staple cotton, however, is of higher quality than that produced in the USSR and could be used in blends with both domestic cotton and synthetic fibers. Furthermore, Egypt, which is heavily indebted to the USSR as a result of an unfavorable trade balance and long-term credits, could be even more hard-pressed financially if the USSR reduced the imports of those commodities that Egypt can export.

Expansion of production of rice may result in reduced imports of this commodity, especially from Burma, which currently enjoys a favorable balance of trade with the USSR. Imports from Egypt, however, probably would be continued for the same reasons elaborated above for cotton.

Although the USSR is aiming for virtual self-sufficiency in production of synthetic rubber by 1970, this goal probably will not be achieved. Imports of natural rubber, the chief suppliers of which are Malaysia and Indonesia, declined about 20 percent in 1963 from the level of 1961-62, and a further decline probably will take place in 1964. Given the growing requirements of the Soviet economy for rubber, it seems likely that some natural rubber will be imported by 1970, although not on the scale of 1961-63. Imports from Indonesia, especially, probably will be continued because of the heavy financial indebtedness of that country to the USSR.

Finally, for political considerations it behooves the USSR to support the less developed countries in general but especially those countries where the establishment of a socialistic or communistic form of government is a good possibility and where Soviet interests are challenged by those of Communist China or the Western capitalistic nations.

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* Except for rubber, imports of products of tropical and subtropical climates that cannot be produced at all or are produced in insufficient quantities in the USSR -- coffee, cocoa, citrus fruits, and the like -- should not be affected by the improvement of the agricultural situation in 1970.

APPENDIX A

STATISTICAL TABLES OF BASIC DATA

The tables in this appendix contain the basic data used in the statistical analysis of the performance of Soviet agriculture during 1953-63. The tables also contain estimates for 1970 of the acreage, yield, and production of various crops; of production of the principal livestock products; and of livestock herds. These estimates were used in projecting agricultural production in the USSR to 1970.

Table 30

Population of the USSR, Rural and Urban, by Age and Sex a/
January 1959

	Million Persons			Percent of Distribution		
	Total	Rural	Urban	Total	Rural	Urban
Population, all ages	208.8	108.8	100.0	100	52	48
0 to 19 years	78.2	43.4	34.8	100	55	45
Male	39.7	22.1	17.6	100	56	44
Female	38.5	21.3	17.2	100	55	45
20 to 44 years	79.5	37.3	42.2	100	47	53
Male	36.1	16.8	19.3	100	47	53
Female	43.4	20.5	22.9	100	47	53
45 years and above	51.1	28.1	23.0	100	55	45
Male	18.2	9.8	8.4	100	54	46
Female	32.9	18.3	14.6	100	56	44

a. 71/

Table 31

Graduates of Specialized Secondary and Higher Educational Institutions
Employed in the Civilian Economy in the USSR
Selected Years, 1953-62

Thousand Persons [a]

Year	All Graduates			Graduates Trained in an Agricultural Specialty		
	Total	Employed in Agriculture	Employed in Nonagriculture	Total	Employed in Agriculture	Employed in Nonagriculture
1953	4,200	114	4,086	312	96	216
1955	5,133	308	4,825	413	239	174
1956	6,257	360	5,897	475	274	201
1957	6,822	371	6,451	466	281	185
1959	8,017	366	7,651	541	266	275
1960	8,784	388	8,396	579	279	300
1961	9,433	400	9,033	633	297	336
1962	9,956	416	9,540	665	306	359

a. End-of-year employment.

Table 32

Allocation of Trucks, Tractors, and Agricultural Machinery to Soviet Agriculture
1953-63 and Plans for 1964 and 1965

Year	Trucks		Tractors		Agricultural Machinery (Million New Rubles [a])
	Thousand Units	Percent of Production	Thousand Units	Percent of Production	
1953	69	25	76	68	258
1954	116	39	99	73	N.A.
1955	111	34	123	75	540
1956	114	32	140	77	710
1957	125	34	148	73	1,000
1958	102	27	158	72	806
1959	76	22	144	68	689
1960	66	18	157	66	753
1961	70	18	185	70	964
1962	83	22	206	72	1,168
1963	86	22	238	73	1,371
1964 Plan	N.A.	N.A.	540	77	N.A.
1965 Plan	N.A.	N.A.			N.A.

a. Expressed in 1955 prices.

Table 33

Allocation of Chemical Fertilizers to Soviet Agriculture, by Type
1958-63

Thousand Metric Tons

Type of Fertilizer	1958	1959	1960	1961	1962	1963 a/
Total	10,626	11,114	11,404	12,073	13,645	15,965
Nitrogen (20.5 percent N)	3,348	3,461	3,749	4,189	5,218	6,634
Potassium (41.6 percent K_2O)	1,786	1,892	1,842	1,690	1,985	2,166
Phosphorus (18.7 percent P_2O_5)	4,391	4,480	4,403	4,506	4,562	5,184
Phosphorite meal (19 percent P_2O_5)	1,095	1,273	1,392	1,609	1,764	1,852
Boromagnesium and boron b/	6	8	18	79	116	129

a. Preliminary data from source 72/.
b. Including boromagnesium and boron fertilizers expressed as 7.5 percent and 10 percent boric acid, respectively.

Table 34

Total Cultivated and Sown Acreage in the USSR, by Republic
1962 and Estimates for 1970

Million Hectares

Republic	Total Cultivated Area			
		1970		
	1962	Total a/	Fallow b/	Sown Area c/
Total	223.5	231.5	23.5	208
RSFSR	133.9	138.5	14.0	124.5
Ukraine	34.0	34.5	0.2	34.3
Kazakhstan	33.8	35.5	9.0	26.5
Other	21.8	23.0	0.3	22.7

a. It is estimated that the total cultivated area in the USSR will be expanded by an average of 1 million hectares per year from 1962 through 1970 and will be distributed as indicated. From 1958 through 1962, which follows the period of intensive development of the "new lands," the average annual increase in the total cultivated area was 1.4 million hectares. For data on the total cultivated area, see Table 35 (p. 102, below).

b. The area in clean fallow is estimated as follows:

RSFSR -- More than 10 percent of the total cultivated area will be left fallow each year by 1970. This will permit about 15 to 20 percent of the cultivated land in the "new lands" regions to be left fallow.

Ukraine -- By 1970 the area in fallow will be about the same as in 1962.

Kazakhstan -- About one-fourth of the cultivated area will be left fallow by 1970.

Other -- The amount of fallow in 1970 in these republics will be slightly less than in 1962.

c. Residual.

Table 35

Sown Acreage in the USSR, by Crop
Selected Years, 1958-62, and Estimates for 1970

Million Hectares

Crop	1958	1960	1962	Estimated by Zemskiy a/	1970
Grain	125.2	121.7	135.9	143.4	125
Wheat	66.6	60.4	67.4	61.1	61
Rye	17.9	16.2	16.9	19.9	17
Barley	9.7	12.1	16.3	10.1	13
Oats	14.8	12.8	6.9	21.1	10
Corn	8.1	11.2	14.2	21.2	15
Other	8.1	9.0	14.2	10.0	9
Potatoes, other vegetables, and melons	11.7	11.2	10.7	13.5	12
Potatoes	9.5	9.1	8.7	10.2	9.5
Other vegetables	1.5	1.5	1.5	2.3	2
Melons (residual)	0.7	0.6	0.5	0.9	0.5
Technical crops	12.3	13.1	14.3	16.1	17
Cotton	2.2	2.2	2.4	3.0	3
Sugar beets (for processing)	2.5	3.0	3.2	3.2	4.5 b/
Sunflower seed	3.9	4.2	4.4	5.3	5.3
Fiber flax	1.6	1.6	1.7	1.9	1.8
Other (residual)	2.1	2.0	2.6	2.6	2.4
Fodder crops	46.5	57.0	55.2	60.0	54
Total sown area	195.6	203.0	216.0	233.0	208 c/
Total cultivated area	217.9	220.0	223.5	N.A.	231.5 c/

a. 73/. The acreage pattern probably pertains to 1970, inasmuch as the Zemskiy study covers agricultural development over a 15-year period and uses 1955 data as its base.
b. It is assumed that the 4.5 million hectares of sugar beets 74/ for processing planned for 1965 will be maintained through 1970.
c. See Table 34 (p. 101, above).

Table 36

Sown Acreage in the USSR
1953-63 and Estimates for 1970

Million Hectares

Crop	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1970
Grain	106.71	112.10	126.40	128.29	124.58	125.15	119.68	121.69	128.25	135.85	133.80	125
Potatoes, other vegetables, and melons	10.26	10.97	11.44	11.58	11.91	11.69	11.60	11.22	10.85	10.68	10.50	12
Potatoes	8.31	8.71	9.09	9.20	9.78	9.52	9.54	9.14	8.88	8.69	8.50	9.5
Other vegetables	1.31	1.47	1.50	1.57	1.47	1.47	1.47	1.48	1.42	1.50	1.40	2
Melons (residual)	0.64	0.79	0.85	0.81	0.66	0.70	0.59	0.60	0.55	0.50	0.60	0.5
Technical crops	11.47	11.78	12.29	13.15	11.76	12.31	12.43	13.05	13.61	14.28	14.90	17
Cotton	1.88	2.20	2.20	2.06	2.09	2.15	2.15	2.19	2.34	2.39	2.48	3
Sugar beets (for processing)	1.57	1.60	1.76	2.01	2.11	2.50	2.75	3.04	3.12	3.17	3.75	4.5 a/
Sunflower seed	3.90	4.03	4.24	4.51	3.46	3.91	3.90	4.19	4.22	4.39	4.39	5.3
Fiber flax	1.24	1.11	1.48	1.92	1.69	1.60	1.60	1.62	1.62	1.70	1.46	1.8
Other (residual)	2.88	2.84	2.61	2.65	2.41	2.15	2.03	2.01	2.31	2.63	2.82	2.4
Fodder crops	28.73	31.25	35.72	41.73	45.43	46.50	52.61	57.03	51.91	55.17	59.30	54
Total sown area	157.17	166.10	185.85	194.75	193.68	195.65	196.32	202.99	204.62	215.98	218.50	208

a. It is assumed that the 4.5 million hectares of sugar beets for processing planned for 1965 will be maintained through 1970.

Table 37

Sown Acreage, Yield, and Production of Grain in the USSR
1953-63 and Estimates for 1970

Year	Area (Million Hectares)	Yield (Centners per Hectare)	Production a/ (Million Metric Tons)	
			Total	Mature Grain b/
1953	106.71	7.7	82.5	82.5
1954	112.10	7.6	85.6	85.6
1955	126.40	8.4	106.8	103.7
1956	128.29	9.0	115.0	112.5
1957	124.58	8.4	105.0	102.6
1958	125.15	10.0	125.0	119.5
1954-58 average	123.30	8.7	107.5	104.8
1959	119.68	8.4	100.0	95.7
1960	121.69	8.2	100.0	93.0
1961	128.25	9.0	115.0	109.5
1962	135.85	8.5	115.0	109.0
1963	133.80	7.1	95.0	93.0
1959-63 average	127.85	8.2	105.0	100.0
1970	125	12	150	145

a. Production data are estimates except for 1953-55 and 1957.
b. Excluding immature corn.

Table 38

Sown Acreage, Yield, and Production of Potatoes in the USSR
1953-63 and Estimates for 1970

Year	Area (Million Hectares)	Yield (Centners per Hectare)	Production (Million Metric Tons)
1953	8.31	87	72.6
1954	8.71	86	75.0
1955	9.09	79	71.8
1956	9.20	104	96.0
1957	9.78	90	87.8
1958	9.52	91	86.5
1954-58 average	9.26	90	83.4
1959	9.54	91	86.6
1960	9.14	92	84.4
1961	8.88	95	84.3
1962	8.69	80	69.7
1963	8.50	88	75.0 a/
1959-63 average	8.95	89	80.0
1970	9.5	116	110

a. Estimated.

Table 39

Sown Acreage, Yield, and Production of Vegetables in the USSR a/
1953-63 and Estimates for 1970

Year	Area (Million Hectares)	Yield (Centners per Hectare)	Production (Million Metric Tons)
1953	1.31	87	11.4
1954	1.47	81	11.9
1955	1.50	94	14.1
1956	1.57	91	14.3
1957	1.47	101	14.8
1958	1.47	101	14.9
1954-58 average	1.50	93	14.0
1959	1.47	101	14.8
1960	1.48	112	16.6
1961	1.42	113	16.1
1962	1.50	107	16.0
1963	1.40	107	15.0 b/
1959-63 average	1.44	109	15.7
1970	2	135	27

a. Other than potatoes.
b. Estimated.

Table 40

Sown Acreage, Yield, and Production of Cotton in the USSR
1953-63 and Estimates for 1970

Year	Area (Million Hectares)	Yield (Centners per Hectare)	Production a/ (Million Metric Tons)
1953	1.88	20.5	3.85
1954	2.20	19.1	4.20
1955	2.20	17.6	3.88
1956	2.06	21.0	4.33
1957	2.09	20.1	4.21
1958	2.15	20.2	4.34
1954-58 average	2.14	19.6	4.20
1959	2.15	21.6	4.64
1960	2.19	19.6	4.29
1961	2.34	19.4	4.52
1962	2.39	18.0	4.30
1963	2.48	21.0	5.21
1959-63 average	2.31	19.9	4.59
1970	3	21.7	6.5

a. All cotton is procured by the state.

Table 41

Sown Acreage, Yield, Production, and Procurement of Sugar Beets (for Processing) in the USSR 1953-63 and Estimates for 1970

Year	Area (Million Hectares)	Yield (Centners per Hectare)	Million Metric Tons	
			Production	Procurement
1953	1.57	148	23.2	22.9
1954	1.60	124	19.8	19.5 a/
1955	1.76	176	31.0	30.7
1956	2.01	162	32.5	31.5
1957	2.11	188	39.7	38.5
1958	2.50	218	54.4	51.0
1954-58 average	2.00	178	35.5	34.2
1959	2.75	160	43.9	41.4
1960	3.04	190	57.7	52.2
1961	3.12	163	50.9	47.7
1962	3.17	150	47.4	43.9
1963	3.75	119	44.7 b/	41.4
1959-63 average	3.17	154	48.9	45.3
1970	4.5 c/	167	75	70

a. A residual calculated from the average procurement for 1954-58.
b. Estimated on the basis of the average for 1959-62, when production of sugar beets was 108 percent of procurement.
c. It is assumed that the amount planned for 1965 will be maintained through 1970.

Table 42

Sown Acreage, Yield, and Production of Sunflower Seed in the USSR
1953-63 and Estimates for 1970

Year	Area (Million Hectares)	Yield (Centners per Hectare)	Production a/ (Million Metric Tons)
1953	3.90	6.7	2.63
1954	4.03	4.7	1.91
1955	4.24	9.0	3.80
1956	4.51	8.8	3.95
1957	3.46	8.1	2.80
1958	3.91	10.9	4.26
1954-58 average	4.03	8.3	3.34
1959	3.90	7.1	2.78
1960	4.19	8.7	3.65
1961	4.22	10.4	4.37
1962	4.39	10.0	4.41
1963	4.39	9.3	4.10 b/
1959-63 average	4.22	9.2	3.86
1970	5.3	11.7	6.2

a. Official data on production of sunflower seed beginning with 1958 have been reduced by about 8 percent because of excess moisture and trash resulting from the use of the bunker weight in determining the size of the harvest.
b. Estimated.

Table 43

Sown Acreage, Yield, and Production of Fiber Flax in the USSR
1953-63 and Estimates for 1970

Year	Area (Million Hectares)	Yield (Centners per Hectare)	Production (Million Metric Tons)
1953	1.24	1.3	0.16
1954	1.11	2.0	0.22
1955	1.48	2.6	0.38
1956	1.92	2.7	0.52
1957	1.69	2.6	0.44
1958	1.60	2.8	0.44
1954-58 average	1.56	2.6	0.40
1959	1.60	2.2	0.36
1960	1.62	2.6	0.42
1961	1.62	2.5	0.40
1962	1.70	2.5	0.43
1963	1.46	2.4	0.35 a/
1959-63 average	1.60	2.4	0.39
1970	1.8	2.8	0.5

a. Estimated.

Table 44

Production of Sugar and Vegetable Oil and Fish Catch in the USSR
1953-63

Thousand Metric Tons

Item	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Sugar	3,434	2,611	3,419	4,354	4,491	5,433	6,011	6,363	8,376	7,800	6,219
Vegetable oil a/	1,160	1,280	1,168	1,525	1,685	1,465	1,885	1,586	1,815	2,114	2,211
Fish catch	2,195	2,505	2,737	2,849	2,761	2,936	3,075	3,541	3,724	4,167	4,670

a. Not including household production.

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Table 45

Number of Livestock in the USSR
1928, 1953-64, and Estimates for 1970

Million Head

Year a/	Cattle		Hogs	Sheep	Goats	Horses
	Total	Cows				
1928 b/	66.8	33.2	27.7	104.2	10.4	36.1
1953	56.6	24.3	28.5	94.3	15.6	15.3
1954	55.8	25.2	33.3	99.8	15.7	15.3
1955	56.7	26.4	30.9	99.0	14.0	14.2
1956	58.8	27.7	34.0	103.3	12.9	13.0
1957	61.4	29.0	40.8	108.2	11.6	12.4
1958	66.8	31.4	44.3	120.2	9.9	11.9
1959	70.8	33.3	48.7	129.9	9.3	11.5
1960	74.2	33.9	53.4	136.1	7.9	11.0
1961	75.8	34.8	58.7	133.0	7.3	9.9
1962	82.1	36.3	66.7	137.5	7.0	9.4
1963	87.0	38.0	70.0	139.7	6.7	9.1
1964	85.4	38.3	40.8	133.9	5.6	N.A.
1970	110	43	83.2	160.2	3.8	6.1

a. As of 1 January.
b. Contemporary boundaries.

Table 46

Estimated Gross Production of Livestock Feed in the USSR a/
1953-63 and 1970

Million Metric Tons

Year	Type of Feed											
	Concentrated		Succulent							Coarse		
	Grains and Pulses	Byproducts	Silage	Potatoes	Sugar Beet Roots	Fodder Roots	Fodder Melons	Green Corn	Sugar Beet Tops	Hay	Straw	Pasture
1953	15.9	10.6	16.4	17.1	0.3	10.2	0.9	Negl.	13.9	79.0	75.0	334.7
1954	16.6	10.6	20.3	18.7	0.3	9.7	1.4	Negl.	11.9	76.2	75.3	335.5
1955	22.8	13.6	48.1	16.1	0.3	11.8	2.7	15.3	18.6	75.4	91.4	354.9
1956	28.6	13.8	63.5	36.7	1.0	11.9	2.3	46.8	19.5	78.6	81.1	364.6
1957	20.9	14.0	78.8	29.4	1.2	11.3	1.9	37.7	23.8	80.5	88.6	369.8
1958	30.1	16.6	162.4	29.1	3.4	14.7	2.0	65.0	32.6	97.8	90.6	651.9
1959	20.4	16.0	170.4	29.3	4.2	10.5	1.4	74.6	27.4	89.7	76.0	376.6
1960	16.6	16.6	230.4	27.4	11.4	8.9	1.9	92.4	38.2	94.4	71.1	373.5
1961	24.1	16.8	212.6	27.2	16.5	3.3	1.7	37.1	39.6	84.3	93.0	364.5
1962	22.9	17.0	217.9	17.4	27.9	2.0	1.5	69.2	43.1	77.2	90.3	367.9
1963	22.3	10.6	165.7	21.4	16.6	2.0	0.8	65.8	34.8	64.5	78.8	350.0
1970 b/	57.5	18.4	217.7	49.0	23.0	4.6	1.7	89.7	42.0	85.0	100.0	375.0
1970 c/	64.2	17.6	245.5	53.5	23.8	4.8	1.8	92.7	45.0	92.4	103.4	387.8

a. Gross production (including waste) except concentrated feeds, potatoes, and sugar beets. Quantities for the latter commodities are residual quantities after deducting waste, seed uses, industrial uses, and food uses from the current year gross production. Other concentrates are estimated as a percent of grain used for food.
b. Probable level of production in 1970.
c. Possible level of production in 1970.

Table 47

Estimated Net Availability of Feed Units in the USSR a/ 1953-63 and 1970

Million Metric Tons

Year	Type of Feed: Concentrated: Grains and Pulses	Concentrated: Byproducts	Concentrated: Total	Succulent: Silage	Succulent: Potatoes	Succulent: Sugar Beet Roots	Succulent: Fodder Roots	Succulent: Fodder Melons	Succulent: Green Corn	Succulent: Sugar Beet Tops	Succulent: Total	Coarse: Hay	Coarse: Straw	Coarse: Total	Pasture	Total: Nonconcentrated Feeds	Total: All Feeds
1953	21.2	12.7	33.9	N.A.	4.9	0	N.A	0.1	Negl.	1.5	N.A.	N.A.	N.A.	N.A.	54.2	N.A.	N.A.
1954	19.3	12.7	32.0	1.7	4.9	0	1.1	0.1	Negl.	1.3	9.1	32.2	13.1	45.3	54.3	108.7	140.7
1955	22.4	16.3	38.7	3.1	5.0	0	1.1	0.2	2.2	2.0	13.6	31.4	14.1	45.5	57.3	116.4	155.1
1956	29.6	16.6	46.2	5.1	6.4	0.1	1.3	0.2	6.7	2.1	21.9	31.6	15.4	47.0	59.1	128.0	174.2
1957	31.3	16.8	48.1	6.5	9.6	0.2	1.3	0.2	5.4	2.6	25.8	32.8	14.6	47.4	59.9	133.1	181.2
1958	28.7	19.9	48.6	11.0	8.2	0.3	1.3	0.2	9.4	3.5	33.9	35.7	15.6	51.3	105.6	190.8	239.4
1959	32.3	19.2	51.5	15.1	8.2	0.7	1.4	0.1	10.7	3.0	39.2	39.3	15.0	54.3	61.0	154.5	206.0
1960	22.9	19.9	42.8	18.2	8.0	1.2	1.1	0.2	13.3	4.1	46.1	37.7	13.0	50.7	60.5	157.3	200.1
1961	22.9	20.2	43.1	20.2	7.7	2.4	0.8	0.2	5.3	4.3	40.9	37.7	13.7	51.4	59.1	151.4	194.5
1962	28.4	20.4	48.8	19.6	6.7	3.7	0.3	0.1	10.0	4.7	45.1	33.9	16.1	50.0	59.6	154.7	203.5
1963	27.2	12.7	39.9	17.5	5.2	4.4	0.2	0.1	7.3	3.8	38.5	30.2	14.4	44.6	56.7	139.8	179.7
1970 b/	65.2	22.1	87.3	19.8	13.2	4.1	0.5	0.2	12.9	4.5	55.2	35.2	17.5	52.7	60.8	168.7	256.0
1970 c/	67.8	21.1	88.9	22.3	13.6	4.3	0.5	0.2	13.3	4.9	59.1	38.2	18.1	56.3	62.8	178.2	267.1

a. Gross production of feed commodities (see Table 46, p. 113, above) was converted to annually available tons of oat grain by sucessively applying the following factors:

Type of Feed	Net Production as a Proportion of Production for Feed	Proportions of the Current Year's Production Fed in the Current Year and in the Following Year	Factors for Converting Quantities of Feed Materials to Oat Feed Units
Grains and pulses	1.0	1/3 to 2/3	1.2
Byproducts	1.0	1 to 0	1.2
Silage	0.65	1/3 to 2/3	0.14
Potatoes	1.0	1/3 to 2/3	0.28
Sugar beet roots	1.0	1/3 to 2/3	0.18
Fodder roots	0.9	1/3 to 2/3	0.12
Fodder melons	0.9	1 to 0	0.10
Green corn	0.9	1 to 0	0.16
Sugar beet tops	0.9	1 to 0	0.12
Hay	0.9	1/3 to 2/3	0.46
Straw	0.7	1/3 to 2/3	0.25
Pasture	0.9	1 to 0	0.18

b. Probable level of the availability of feed in 1970.
c. Possible level of the availability of feed in 1970.

Table 48

Official and Estimated Production of the Principal Livestock Products in the USSR
1928, 1953-63, and 1970

Million Metric Tons [a]

Year	Meat			Milk			Wool [b]	Eggs
	Official Production Data	Reduction [c] (Percent)	Production Estimate	Official Production Data	Reduction [c] (Percent)	Production Estimate	Official Production Data	Official Production Data (Billion Units)
1928 [d]	4.90		4.90	31.0		31.0	0.182	10.8
1953	5.82	10	5.24	36.5	5	34.7	0.235	16.1
1954	6.28	10	5.65	38.2	5	36.3	0.230	17.2
1955	6.32	10	5.69	43.0	5	40.8	0.256	18.5
1956	6.60	10	5.94	49.1	5	46.6	0.261	19.5
1957	7.37	11	6.56	54.7	6	51.4	0.289	22.3
1958	7.70	12	6.78	58.7	7	54.6	0.322	23.0
1959	8.92	14	7.67	61.7	9	56.1	0.356	25.6
1960	8.68	15	7.38	61.7	10	55.5	0.357	27.5
1961	8.70	15	7.40	62.6	10	56.3	0.366	29.3
1962	9.46	14	8.14	63.9	9	58.1	0.371	30.1
1963	10.20	13	8.87	61.2	8	56.3	0.374	28.8
1970	13 [e]	12	11.5	75 [e]	7	70	0.450 [e]	38 [e]

a. Unless otherwise indicated.
b. Data include small amounts of animal fibers other than wool.
c. It is estimated for this report that the official production data on meat and milk have to be reduced by the percentages indicated in order to arrive at estimates of the amounts of meat and milk actually produced.
d. Data pertain to production within the boundaries of the USSR in 1928.
e. Estimated.

Table 49

Estimated Availability of Food Per Capita for Human Consumption in the USSR
1953-63

Kilograms Per Capita a/

Food Product	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Meat (net of slaughter fats) b/	24.1	25.6	26.5	27.1	28.4	29.1	31.7	30.3	29.9	31.6	34.5
Edible slaughter fats c/	2.4	2.5	2.5	2.5	2.7	2.8	3.1	3.0	2.9	3.0	3.4
Milk d/	165	170	187	210	228	237	240	233	233	236	226
Fish e/	6.0	7.8	8.7	8.9	8.5	8.9	8.9	9.6 f/	10.5 g/	11.1	12.1
Sugar h/	17.6	18.9	20.2	21.5	22.8	24.0 i/	26.5	29.0 i/	29.8	30.6	31.5
Potatoes	160	156	152	148	144	140 j/	140 j/	140 j/	140 j/	125	125
Other vegetables	60.1	61.8	72.3	71.9	73.3	72.5	71.2	78.4	75.4	73.4	71.2
Vegetable oil k/	4.4	4.7	4.8 l/	5.3	5.4	4.8	5.9	4.9	5.2 l/	5.8	6.3
Flour m/	206	203	198	197	196	195	187	189	188	187	173
Estimated total daily caloric intake per capita n/	3,100	3,100	3,100	3,150	3,200	3,200	3,200	3,200	3,200	3,200	3,100

a. Unless otherwise indicated. Kilograms per capita are derived by dividing net availabilities (estimated total domestic production available for food with adjustments made for trade and changes in stocks) by midyear population data given in Table 1 (p. 9, above).
b. Total slaughter fats were estimated to be about 13 percent of the estimated total production of meat as given in Table 48 (p. 115, above).
c. Edible slaughter fats are estimated to be two-thirds of total slaughter fats.
d. It is estimated that about 10 percent of the total production of milk (see Table 48, p. 115, above) was used as livestock feed.
e. Based on consumption data for 1960 and 1961, 75/ nonfood use (mostly waste) was estimated to be about 40 percent of the total fish catch. See Table 44 (p. 111, above).
f. 76/
g. 77/
h. Khrushchev in his Plenum speech of February 1964 78/ gave sugar consumption data for 1952 and 1963. Except for 1958, 1960, and 1963, consumption was estimated by interpolation.
i. 79/
j. According to source 80/ an average of about 35 percent of the total potato crop was used for human consumption during the period 1958-61.
k. According to consumption data for 1955 and 1961, about 36 percent of the total production of vegetable oils was used for industrial purposes. This percentage was applied to production for the remaining years in arriving at estimates of the availability of vegetable oil for human consumption.
l. 81/
m. Calculated as a residual. The difference between the total calories derived from the foods listed above in the table and about 95 percent of the estimated total daily caloric intake per capita is estimated to have been made up by flour. The remaining 5 percent of the caloric intake is estimated to have been derived from eggs, fruit, nuts, and the like -- items not included in the table.
n. Source 82/ indicates that the daily caloric intake per capita has been within the range of 3,000 to 3,200.

APPENDIX B

STATISTICAL TABLES
CONCERNED WITH THE COMPUTATION AND PROJECTION
OF NET AGRICULTURAL PRODUCTION IN THE USSR

The tables in this appendix contain the data and methodology used in computing and projecting net agricultural production in the USSR. Details concerning the methodology used are contained in the footnotes to the tables.

Table 50

Estimated Indexes of Net Agricultural Production in the USSR
1953-63

1953 = 100

Year	Basic Index: Valued at 1958 Base Prices a/	Alternative Indexes: Valued at 1958 Actual Prices b/	Alternative Indexes: Valued at 1963 Actual Prices c/
1953	100	100	100
1954	103	103	103
1955	119	118	118
1956	133	132	133
1957	133	133	132
1958	147	146	145
1959	141	141	140
1960	141	141	140
1961	154	143	152
1962	152	152	149
1963	144 d/		

a. Unless otherwise indicated, index of the total values contained in Table 60 (p. 129, below).
b. Index of the total values contained in Table 61 (p. 131, below).
c. Index of the total values contained in Table 62 (p. 132, below).
d. See Table 60, footnote b (p. 130, below) for the derivation of this estimate.

Table 51

Components Used in Calculating Estimated Net Agricultural Production in the USSR a/
1953-63

Million Metric Tons b/

Item	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Grain c/	65.7	66.6	84.5	93.8	83.8	101.5	77.4	73.8	89.1	88.9	72.8
Potatoes c/	56.1	57.7	54.3	77.4	69.7	68.4	69.2	67.5	67.8	53.5	58.5
Other vegetables	11.4	11.9	14.1	14.3	14.8	14.9	14.8	16.6	16.1	16.0	15.0
Technical crops											
Cotton	3.85	4.20	3.88	4.33	4.21	4.34	4.64	4.29	4.52	4.30	5.21
Sugar beets (state procurement) d/	22.9	19.5	30.7	31.5	38.5	51.0	41.4	52.2	47.7	43.9	41.4
Sunflower seed	2.63	1.91	3.80	3.95	2.80	4.26	2.78	3.65	4.37	4.41	4.10
Fiber flax	0.16	0.22	0.38	0.52	0.44	0.44	0.36	0.42	0.40	0.43	0.35
Livestock products											
Meat	5.24	5.65	5.69	5.94	6.56	6.78	7.67	7.38	7.40	8.14	8.87
Milk e/	31.2	32.7	36.7	41.9	46.3	49.1	50.5	50.0	50.7	52.3	50.7
Wool	0.235	0.230	0.256	0.261	0.289	0.322	0.356	0.357	0.366	0.371	0.374
Eggs (billion units)	16.1	17.2	18.5	19.5	22.3	23.0	25.6	27.5	29.3	30.1	28.8
Less feed f/											
Grain	17.7	16.1	18.7	24.7	26.1	23.9	26.9	19.1	19.1	23.7	22.7
Potatoes	17.6	17.6	17.9	22.9	34.3	29.3	29.2	28.6	27.4	23.9	18.7
Changes in the number of livestock (million head)											
Cattle	-0.8	0.9	2.1	2.6	5.4	4.0	3.4	1.6	6.3	4.9	-1.6
Hogs	4.8	-2.4	3.1	6.8	3.5	4.4	4.7	5.3	8.0	3.3	-29.2
Sheep and goats	5.6	-2.5	3.2	3.6	10.3	9.1	4.8	-3.7	4.2	1.9	-6.9

a. See Tables 37 through 43 (Appendix A, pp. 104 through 110, above), 45 (Appendix A, p. 112, above), and 48 (Appendix A, p. 115, above).
b. Unless otherwise indicated.
c. Production less seed used for the crop harvested in the following year. See Table 54 (p. 123, below).
d. It is assumed that sugar beets that are not procured are fed to livestock or are used in production of seed.
e. Production less 10 percent that is estimated to have been fed to livestock.
f. See Tables 52 and 53 (pp. 121 and 122, respectively, below).

Table 52

Estimated Production and Utilization of Grain in the USSR 1953-63

Million Metric Tons

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Production a/	82.5	85.6	103.7	112.5	102.6	119.5	95.7	93.0	109.5	109.0	93.0
Utilization											
Seed b/	69.6	74.0	76.9	75.9	81.7	81.4	80.3	82.4	86.4	87.1	72.7
Waste c/	16.8	19.0	19.2	18.7	18.8	18.0	18.2	19.2	20.4	20.1	20.2
Net exports d/	5.0	5.1	6.2	6.8	6.2	7.2	5.7	5.6	6.6	6.5	5.6
Industrial use g/	1.4 e/	3.1 e/	2.9	2.1	7.0	3.9	6.2	6.1	6.8	7.4	0 f/
Food h/	2.0	2.4	3.1	2.1	2.8	3.6	2.9	2.8	3.3	3.3	2.8
	44.4	44.4	45.5	46.2	46.9	48.7	47.3	48.7	49.3	49.8	44.1
Residual i/	12.9	11.6	26.8	36.6	20.9	38.1	15.4	10.6	23.1	21.9	20.3
Net stock change j/	3.0 k/	5.0	-4.0	-8.0	0	-8.0	5.0	6.0	1.0	1.0	2.0
Available for feed l/	15.9	16.6	22.8	28.6	20.9	30.1	20.4	16.6	24.1	22.9	22.3
Period when grain is used as feed m/											
One-third = 1 July - 31 December	5.3	5.5	7.6	9.5	7.0	10.0	6.8	5.5	8.0	7.6	7.4
Two-thirds = 1 January - 30 June	12.4 n/	10.6	11.1	15.2	19.1	13.9	20.1	13.6	11.1	16.1	15.3
Grain consumed as feed	17.7	16.1	18.7	24.7	26.1	23.9	26.9	19.1	19.1	23.7	22.7

a. See Table 37 (Appendix A, p. 104, above).
b. See Table 54 (p. 123, below).
c. Largely on the basis of experience in the US, waste is estimated to equal 6 percent of production. 83/
d. Unless otherwise indicated, the net exports are calculated from official import and export data. 84/
e. 85/
f. Estimated.
g. Estimates based on information in source 86/.
h. The amounts of grain required for food were calculated by multiplying the flour requirements per capita contained in Table 49 (Appendix A, p. 116, above) by midyear population data found in Table 1 (p. 9, above) and converting the flour to grain by the use of the following extraction rates: 1953-54 and 1963, about 88 percent; 1955-57, about 85 percent; and 1958-62, about 83 percent.
i. The amount that production exceeds utilization for seed, waste, net exports, industrial use, and food. This residual is available for use as livestock feed or for increasing stocks.
j. Estimates that balance out additions to and withdrawals from stock for the period 1952-63 if a net addition of 3 million tons to stocks is assumed for 1952. These estimates contain some notion of the relative needs for grain as livestock feed in the years covered by this report.
k. 87/
l. Residual plus or minus net changes in stocks.
m. It is assumed that one-third of the grain used as feed from a given crop will be fed during the calendar year in which it is produced or during the period 1 July - 31 December and that two-thirds will be fed during the following calendar year or during the period 1 January - 30 June.
n. The amount of grain used for feed from the 1952 harvest was estimated at 18.6 million tons on the basis of information contained in source 88/.

Table 53

Estimated Production and Utilization of Potatoes in the USSR
1953-63

Million Metric Tons

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Production a/	72.6	75.0	71.8	96.0	87.8	86.5	86.6	84.4	84.3	69.7	75.0
Utilization	55.5	56.3	55.7	59.3	58.4	57.4	57.3	57.0	57.1	52.3	53.6
Seed b/	16.5	17.3	17.5	18.6	18.1	18.1	17.4	16.9	16.5	16.2	16.5
Waste c/	7.3	7.5	7.2	9.6	8.8	8.6	8.7	8.4	8.4	7.0	7.5
Industrial use d/	1.4	1.4	1.2	1.6	2.3	1.7	1.7	1.7	1.7	1.4	1.5
Food e/	30.3	30.1	29.8	29.5	29.2	29.0	29.5	30.0	30.5	27.7	28.1
Residual for feed	17.1	18.7	16.1	36.7	29.4	29.1	29.3	27.4	27.2	17.4	21.4
Period when potatoes are used as feed f/											
One-third = 1 July - 31 December	5.7	6.2	5.4	12.2	9.8	9.7	9.8	9.1	9.1	5.8	7.1
Two-thirds = 1 January - 30 June	11.9 g/	11.4	12.5	10.7	24.5	19.6	19.4	19.5	18.3	18.1	11.6
Potatoes consumed as feed	17.6	17.6	17.9	22.9	34.3	29.3	29.2	28.6	27.4	23.9	18.7

a. See Table 38 (Appendix A, p. 105, above).
b. See Table 54 (p. 123, below).
c. Waste is estimated to equal 10 percent of production. 89/
d. Source 90/ for the years 1953-57. Industrial use for the years 1958-63 was estimated at 2 percent of production. Industrial use for the years 1950-57 averaged 2 percent of production.
e. Source 91/ gives per capita consumption at 140 kilograms per capita for the years 1958-61. Consumption rates for the other years were estimated as follows: 1953, 160 kilograms per capita; 1954-57, interpolated; 1962-63, about 120 kilograms per capita.
f. The distribution of the use of potatoes for feed during the calendar year is assumed to be the same as for grain. See Table 52, footnote m (p. 121, above).
g. The amount of potatoes used for feed from the crop harvested in 1952 is estimated to have been 17.9 million tons.

Table 54

Sown Acreage and Seed Requirements for Grain and Potatoes in the USSR
1953-64

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Grain												
Sown area (million hectares) a/	106.71	112.10	126.40	128.29	124.58	125.15	119.68	121.69	128.25	135.85	133.80	135.00 b/
Seed (million metric tons) c/	16.0	16.8	19.0	19.2	18.7	18.8	18.0	18.2	19.2	20.4	20.1	20.2
Potatoes												
Sown area (million hectares) a/	8.31	8.71	9.09	9.20	9.78	9.52	9.54	9.14	8.88	8.69	8.50	8.70 b/
Seed (million metric tons) d/	15.8	16.5	17.3	17.5	18.6	18.1	18.1	17.4	16.9	16.5	16.2	16.5

a. See Table 36 (Appendix A, p. 103, above).
b. Estimated.
c. The amount of grain used for seed is estimated to equal 0.15 ton per hectare of the area in grain. 92/
d. The amount of potatoes used as seed is estimated at 1.9 tons per hectare. 93/

Table 55

Procurement Prices in the USSR a/
1958 and 1963

Rubles per Metric Ton b/

Item	Base Prices Published in 1958 c/	Actual Prices Used as Alternative Weights	
		1958 d/	1963 e/
Grain	74	63	75.6 f/
Potatoes	40	36	71.0
Other vegetables	70 g/	70 g/	75.2
Cotton	340	340	383.0
Sugar beets (state procurement)	23.5	21.15	28.7
Sunflower seed	172	146	181.0
Fiber flax	2,300	1,470	2,300 h/
Meat	1,164 i/	1,069 i/	1,368 i/
Milk	115	115	121.8
Wool	3,030 j/	3,121	3,786.7
Eggs (rubles per thousand units)	60	60	70.0
Cattle (rubles per head) k/	144	137	185
Hogs (rubles per head) k/	75	66	81
Sheep and goats (rubles per head) k/	20	19	24

a. The procurement prices in this table are the weights used, along with the data in Table 50 (p. 119, above), to calculate the indexes of net agricultural production. The base prices announced in 1958, however, are used as the basic weights for this report.
b. Unless otherwise indicated.
c. 94/
d. 95/
e. 96/
f. Price for wheat.
g. See Table 56 (p. 125, below).
h. Assumed to be the same as the 1958 base price.
i. See Table 57 (p. 126, below).
j. Prices for the four grades of wool obtained from source 97/ and relative importance of each grade in total production of wool obtained from source 98/.
k. See Table 59 (p. 128, below).

Table 56

Derivation of Weighted Prices for Vegetables in the USSR a/
1958

Type	Distribution of Sown Area b/ (Percent)	Planned Yields c/ (Metric Tons per Hectare)	Production Weights	1958 State Purchase Price d/ (Rubles per Metric Ton)	Value Weights
Cabbage	30.0	1.75	52.5	41	2,153
Cucumbers	20.0	1.10	22.0	85	1,870
Tomatoes	19.5	1.35	26.3	83	2,183
Onions and garlic	8.0	0.85	6.8	190 e/	1,292
Beets	7.5	1.30	9.8	43	421
Carrots	7.0	1.20	8.4	66	554
Other	8.0	1.25 f/	10.0	85 f/	850
Total	100.0		135.8	70 g/	9,323

a. Other than potatoes.
b. 99/
c. 100/
d. Source 101/ unless otherwise indicated. Expressed in new rubles.
e. 102/
f. Simple average of the other yields and prices in the series.
g. Calculated by dividing the value weight (9,323) by the production weight (135.8) and then rounding.

Table 57

Derivation of Meat Prices in the USSR
1958 and 1963

Item	Rubles per Metric Ton of Live Weight: 1958 Base Price a/	1958 Actual Price b/	1963 Actual Price c/	Dressing (Slaughter Weight as a Percent of Live Weight) d/	Rubles per Metric Ton of Slaughter Weight: 1958 Base Price	1958 Actual Price	1963 Actual Price	1953-57 Distribution of Slaughter Weight e/ (Percent)	Procurement Price (Rubles per Metric Ton): 1958 Base Price	1958 Actual Price	1963 Actual Price
Cattle	619	589	799	54	1,146	1,091	1,480	34.3	393	373	508
Hogs	898	797	980	73	1,230	1,092	1,342	42.0	517	458	564
Sheep and goats	536	508	630 f/	49	1,094	1,037	1,286	11.7	128	121	150
Poultry	816	750 g/	950 f/	80	1,020	938	1,188	7.7	79	72	91
Other	N.A.	N.A.	N.A.	60	1,094 h/	1,037 h/	1,286 h/	4.3	47	45	55
Total								100.0	1,164	1,069	1,368

a. 103/
b. 104/
c. 105/
d. See Table 58 (p. 127, below).
e. 106/
f. Estimated at 117 percent of the base price. The average actual price for cattle and hogs in 1963 was 117 percent of the 1958 base price for these types.
g. Estimated at 92 percent of the 1958 base price. The average actual price for cattle, hogs, sheep, and goats in 1958 was 92 percent of the average 1958 base price for these types.
h. Assumed to be the same as the price for sheep and goats.

Table 58

Calculated Dressing Percentage of Livestock in the USSR
1953-57

Item	Total Production of Meat 1953-57 (Million Metric Tons)		Dressing Average 1953-57 (Slaughter Weight as a Percent of Live Weight)	
	Slaughter Weight [a]	Live Weight	Industrial Meat [b]	Total Meat
Cattle	11.1	20.5 [c]	44	54 [d]
Hogs	13.6	18.6 [a]	60	73 [d]
Sheep and goats	3.8	7.7 [c]	40	49 [e]
Poultry	2.5	3.1 [c]	N.A.	80 [f]
Other	1.4	2.3 [c]	N.A.	60 [f]
Total	32.4	51.9 [a]	N.A.	62 [d]

a. 107/
b. 108/
c. Slaughter weight divided by the dressing percentage for total meat.
d. Slaughter weight divided by live weight.
e. Increased proportional to the increase in the dressing percentage for hogs: 73 percent divided by 60 percent yields a factor of 122.
f. Assumed.

Table 59

Derivation of Prices per Head of Livestock in the USSR
1958 and 1963

Item	Rubles per Metric Ton of Live Weight [a]			Average Weight of Livestock Purchased in 1953-59 [b] (Kilograms)	Rubles per Head of Live Weight		
	1958 Base Price	1958 Actual Price	1963 Actual Price		1958 Base Price	1958 Actual Price	1963 Actual Price
Cattle	619	589	799	232	144	137	185
Hogs	898	797	980	83	75	66	81
Sheep and goats	536	508	630	38	20	19	24

a. See Table 57 (p. 126, above).
b. 109/

Table 60

Value of Estimated Net Agricultural Production in the USSR Using 1958 Base Prices as Weights a/*
1953-63

Billion New Rubles

Item	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Grain	4.86	4.93	6.25	6.94	6.20	7.51	5.73	5.46	6.59	6.58	5.39
Potatoes	2.24	2.31	2.17	3.10	2.79	2.74	2.77	2.70	2.71	2.14	2.34
Other vegetables	0.80	0.83	0.99	1.00	1.04	1.04	1.04	1.16	1.13	1.12	1.05
Technical crops	2.67	2.73	3.56	4.09	3.82	4.42	3.86	4.29	4.33	4.24	4.25
Cotton	1.31	1.43	1.32	1.47	1.43	1.48	1.58	1.46	1.54	1.46	1.77
Sugar beets (state procurement)	0.54	0.46	0.72	0.74	0.90	1.20	0.97	1.23	1.12	1.03	0.97
Sunflower seed	0.45	0.33	0.65	0.68	0.48	0.73	0.48	0.63	0.75	0.76	0.71
Fiber flax	0.37	0.51	0.87	1.20	1.01	1.01	0.83	0.97	0.92	0.99	0.80
Livestock products	9.36	10.18	10.63	10.94	11.88	12.96	14.20	14.52	14.80	15.70	16.58
Meat	6.10	6.58	6.62	6.91	7.64	7.89	8.93	8.59	8.61	9.47	10.32
Milk	3.59	3.76	4.22	4.82	5.32	5.65	5.81	5.75	5.83	6.01	5.83
Wool	0.71	0.70	0.78	0.79	0.88	0.98	1.08	1.08	1.11	1.12	1.13
Eggs	0.97	1.03	1.11	1.17	1.34	1.38	1.54	1.65	1.76	1.81	1.73
Less feed											
Grain	1.31	1.19	1.38	1.83	1.93	1.77	1.99	1.41	1.41	1.75	1.68
Potatoes	0.70	0.70	0.72	0.92	1.37	1.17	1.17	1.14	1.10	0.96	0.75
Livestock	0.36	-0.10	0.59	0.95	1.25	1.09	0.94	0.56	1.59	1.00	-2.56 b/
Cattle	-0.11	0.13	0.30	0.37	0.78	0.58	0.49	0.23	0.91	0.71	-0.23
Hogs	0.36	-0.18	0.23	0.51	0.26	0.33	0.35	0.40	0.60	0.25	-2.19
Sheep and goats	0.11	-0.05	0.06	0.07	0.21	0.18	0.10	-0.07	0.08	0.04	-0.14
Total	20.29	20.88	24.19	27.02	26.98	29.76	28.54	28.69	31.15	30.78	27.05 b/

* Footnotes follow on p. 130.

Table 60

Value of Estimated Net Agricultural Production in the USSR Using 1958 Base Prices as Weights a/
1953-63
(Continued)

a. Calculated by multiplying the components in Table 51 (p. 120, above) by the prices in Table 55, column 1 (p. 124, above).
b. The precipitous decline in the number of hogs in 1963 caused considerable difficulty in calculating a reliable value of net agricultural production using the established methodology. There is every reason to believe that changes in the number of livestock in 1963 should not be weighted as heavily as in other years in the series. Much of the decline in the number of livestock in 1963 was the result of slaughtering young animals or animals of very light weight and foregoing the breeding of livestock. Thus it is not appropriate to weight this decline in number by the usual method of applying the value of animals of average size purchased by the state during 1953-59.

The method of determining the value of the decline in the number of livestock in 1963 is as follows. On the basis of the past relationships between the number of meat-producing animals at the beginning of the year and production of meat during that year, production of meat for 1963 was projected at 8.53 million tons (9.93 billion rubles). Assuming that the value of the meat produced in excess of this amount was equal to the value of the decline in the herd, the following value of net agricultural production is derived:

Item	1962	1963
	Billion Rubles	
Meat	9.47	9.93
Livestock	1.00	0
Other components	20.31	19.29
Total	30.78	29.22
	Index (1953 = 100)	
	152	144

This very unusual procedure, which is used because of a very unusual situation, is believed to provide a more accurate measure of the actual amount of change in net agricultural production than that derived through the use of the established methodology.

Table 61

Value of Estimated Net Agricultural Production in the USSR Using 1958 Actual Prices as Weights a/
1953-63

Billion New Rubles

Item	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Grain	4.14	4.20	5.32	5.91	5.28	6.39	4.88	4.65	5.61	5.60	4.59
Potatoes	2.02	2.08	1.95	2.79	2.51	2.46	2.49	2.43	2.44	1.93	2.11
Other vegetables	0.80	0.83	0.99	1.00	1.04	1.04	1.04	1.16	1.13	1.12	1.05
Technical crops	2.41	2.44	3.08	3.48	3.30	3.84	3.40	3.71	3.78	3.66	3.76
Cotton	1.31	1.43	1.32	1.47	1.43	1.48	1.58	1.46	1.54	1.46	1.77
Sugar beets (state procurement)	0.48	0.41	0.65	0.67	0.81	1.08	0.88	1.10	1.01	0.93	0.88
Sunflower seed	0.38	0.28	0.55	0.58	0.41	0.63	0.41	0.53	0.64	0.64	0.60
Fiber flax	0.24	0.32	0.56	0.76	0.65	0.65	0.53	0.62	0.59	0.63	0.51
Livestock products	9.14	9.91	10.39	10.77	11.70	12.72	13.92	14.17	14.45	15.33	16.11
Meat	5.60	6.04	6.08	6.35	7.01	7.25	8.20	7.89	7.91	8.70	9.48
Milk	3.59	3.76	4.22	4.82	5.32	5.65	5.81	5.75	5.83	6.01	5.83
Wool	0.73	0.72	0.80	0.81	0.90	1.00	1.11	1.11	1.14	1.16	1.17
Eggs	0.97	1.03	1.11	1.17	1.34	1.38	1.54	1.65	1.76	1.81	1.73
Less feed											
Grain	1.12	1.01	1.18	1.56	1.64	1.51	1.69	1.20	1.20	1.49	1.43
Potatoes	0.63	0.63	0.64	0.82	1.23	1.05	1.05	1.03	0.99	0.86	0.67
Livestock	0.32	-0.09	0.55	0.88	1.17	1.01	0.87	0.50	1.47	0.93	-2.28
Cattle	-0.11	0.12	0.29	0.36	0.74	0.55	0.47	0.22	0.86	0.67	-0.22
Hogs	0.32	-0.16	0.20	0.45	0.23	0.29	0.31	0.35	0.53	0.22	-1.93
Sheep and goats	0.11	-0.05	0.06	0.07	0.20	0.17	0.09	-0.07	0.08	0.04	-0.13
Total	18.83	19.37	22.28	24.83	25.00	27.46	26.60	26.62	28.88	28.57	25.34

a. Calculated by multiplying the components in Table 51 (p. 120, above) by the prices in Table 55, column 2 (p. 124, above).

Table 62

Value of Estimated Net Agricultural Production in the USSR Using 1963 Actual Prices as Weights a/
1953-63

Billion New Rubles

Item	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Grain	4.97	5.03	6.39	7.09	6.34	7.67	5.85	5.58	6.74	6.72	5.50
Potatoes	3.98	4.10	3.86	5.50	4.95	4.86	4.91	4.79	4.81	3.80	4.15
Other vegetables	0.86	0.89	1.06	1.08	1.11	1.12	1.11	1.25	1.21	1.20	1.13
Technical crops	2.98	3.03	3.93	4.47	4.23	4.90	4.30	4.77	4.81	4.70	4.73
Cotton	1.47	1.61	1.49	1.66	1.61	1.66	1.78	1.64	1.73	1.65	2.00
Sugar beets (state procurement)	0.66	0.56	0.88	0.90	1.10	1.46	1.19	1.50	1.37	1.26	1.19
Sunflower seed	0.48	0.35	0.69	0.71	0.51	0.77	0.50	0.66	0.79	0.80	0.74
Fiber flax	0.37	0.51	0.87	1.20	1.01	1.01	0.83	0.97	0.92	0.99	0.80
Livestock products	10.40	11.31	11.84	12.08	12.85	14.20	15.68	15.99	16.35	17.53	18.70
Meat	7.17	7.73	7.78	8.13	8.97	9.28	10.49	10.10	10.12	11.14	12.13
Milk	3.80	3.98	4.47	5.10	5.64	5.98	6.15	6.09	6.18	6.37	6.18
Wool	0.89	0.87	0.97	0.99	1.09	1.22	1.35	1.35	1.39	1.40	1.42
Eggs	1.13	1.20	1.30	1.36	1.56	1.61	1.79	1.92	2.05	2.11	2.02
Less feed											
Grain	1.34	1.22	1.41	1.87	1.97	1.81	2.03	1.44	1.44	1.79	1.72
Potatoes	1.25	1.25	1.27	1.63	2.44	2.08	2.07	2.03	1.95	1.70	1.33
Livestock	0.37	-0.08	0.72	1.12	1.53	1.32	1.13	0.64	1.92	1.23	-2.84
Cattle	-0.15	0.17	0.39	0.48	1.00	0.74	0.63	0.30	1.17	0.91	-0.30
Hogs	0.39	-0.19	0.25	0.55	0.28	0.36	0.38	0.43	0.65	0.27	-2.37
Sheep and goats	0.13	-0.06	0.08	0.09	0.25	0.22	0.12	-0.09	0.10	0.05	-0.17
Total	23.56	24.28	27.80	31.34	31.01	34.07	32.98	33.02	35.84	35.18	31.37

a. Calculated by multiplying the components in Table 51 (p. 120, above) by the prices in Table 55, column 3 (p. 124, above).

Table 63

Calculation of Estimated Net Agricultural Production in the USSR
1970

Item	Volume a/* (Million Metric Tons b/)				Price h/ (New Rubles per Unit)	Value c/ (Billion New Rubles)			
		Possible					Possible		
	Probable d/	A e/	B f/	C g/		Probable	A	B	C
Grain i/	126.2	131.2	114.2	138.2	74	9.34	9.71	8.45	10.23
Potatoes j/	92	97	84	101	40	3.68	3.88	3.36	4.04
Other vegetables	27	30	24	30	70	1.89	2.10	1.68	2.10
Technical crops						6.07	6.31	5.30	6.88
Cotton	6.5	6.5	6.2	6.9	340	2.21	2.21	2.11	2.35
Sugar beets (state procurement)	70	75	60	80	23.5	1.64	1.76	1.41	1.88
Sunflower seed	6.2	6.4	5.0	7.4	172	1.07	1.10	0.86	1.27
Fiber flax	0.5	0.54	0.4	0.6	2,300	1.15	1.24	0.92	1.38
Livestock products						18.37	18.71	17.71	19.06
Meat	11.5	11.7	11.1	11.9	1,164	13.39	13.62	12.92	13.85
Milk k/	63	65	58.9	67.3	115	7.24	7.48	6.77	7.74
Wool	0.45	0.46	0.432	0.468	3,030	1.36	1.39	1.31	1.42
Eggs l/	38	39	36.6	39.4	60	2.28	2.34	2.20	2.36
Less feed m/									
Grain	54.3	56.5	50.2	58.4	74	-4.02	-4.18	-3.71	-4.32
Potatoes	47.0	48.5	44.6	49.7	40	-1.88	-1.94	-1.78	-1.99
Livestock n/						1.33	1.83	0.22	2.38
Cattle	4.7	6.6	0.8	8.6	144	0.68	0.95	0.12	1.24
Hogs	7.3	9.7	2.1	12.5	75	0.55	0.73	0.16	0.94
Sheep and goats	4.8	7.3	-0.3	9.9	20	0.10	0.15	-0.06	0.20
Total						40.68	42.54	36.72	44.69

* Footnotes follow on p. 134.

Table 63

Calculation of Estimated Net Agricultural Production in the USSR
1970
(Continued)

a. Volume data are based on Tables 21, 22, 25, and 26 (pp. 75, 77, 82, and 84, respectively, above).
b. Unless otherwise indicated.
c. Value data were obtained by multiplying volume data by the price weights.
d. Volume with probable level of fertilizer usage and average weather.
e. Volume with possible fertilizer usage and average weather. Data on crops were obtained from Table 21. Data on livestock products and number of livestock were estimated in proportion to the feed supply. The feed supply figures (grain and potatoes) with possible fertilizer usage and average weather fall midway between the feed supply figures for average and better than average weather conditions with probable fertilizer usage.
f. Volume with probable level of fertilizer usage and worse than average weather.
g. Volume with probable level of fertilizer usage and better than average weather.
h. Basic state procurement price (1 July 1958) weights are in terms of rubles per ton except for the price of eggs, which are in thousand units, and the price of livestock, which is in rubles per head.
i. Production of grain less seed and immature corn.
j. Production of potatoes less seed.
k. Production of milk less 10 percent for feed.
l. Volume data are in terms of billion units.
m. See Table 64 (p. 135, below).
n. The number of livestock is in million head.

Table 64

Estimated Production and Utilization of Grain and Potatoes in the USSR
1970

Million Metric Tons

	Mature Grain [a]					Potatoes				
	Probable [b]		Possible, 1970 [c]			Probable [b]		Possible, 1970 [c]		
	1969	1970	A	B	C	1969	1970	A	B	C
Production		145.0	150.0	133.0	157.0		110.0	115.0	102.0	119.0
Seed [d]		18.8	18.8	18.8	18.8		18.0	18.0	18.0	18.0
Waste [e]		8.7	9.0	8.0	9.4		11.0	11.5	10.2	11.9
Net exports and/or stocks [f]		10.0	10.0	9.0	11.0		0	0	0	0
Industrial use [f]		4.0	4.0	4.0	4.0		2.0	2.0	2.0	2.0
Available for food [g]		46.0	44.0	49.0	43.0		30.0	30.0	30.0	30.0
Available for feed [h]	52.6 [i]	57.5	64.2	45.2	69.8	46.0 [j]	49.0	53.5	41.8	57.1
One-third feed consumed in crop year	17.5	19.2	21.4	15.1	23.3	15.3	16.3	17.8	13.9	19.0
Two-thirds available feed consumed in following year		35.1	35.1	35.1	35.1		30.7	30.7	30.7	30.7
Total feed consumed		54.3	56.5	50.2	58.4		47.0	48.5	44.6	49.7

a. Excluding immature corn.
b. Volume of production and utilization with probable fertilizer usage and average weather.
c. Volume of production and utilization under the following three alternative situations: alternative A is with possible fertilizer usage and average weather; alternative B is with probable fertilizer usage and worse than average weather; and alternative C is with probable fertilizer usage and better than average weather.
d. Seeding rates are from Table 54 (p. 123, above).
e. Waste estimated at 6 percent for grain and 10 percent for potatoes. See Tables 52 and 53 (pp. 121 and 122, respectively, above).
f. Estimated.
g. See Table 65, footnotes h and k (p. 136, below).
h. Residual.
i. Interpolation between 1961-63 average and 1970 availabilities.
j. Interpolation between 1959-61 average and 1970 availabilities.

Table 65

Estimated Availability of Food Per Capita in the USSR a/ 1970

Food Product	Calories per Kilogram	Probable c/		Possible b/					
				A		B		C	
		Kilograms	Thousand Calories	Kilograms	Thousand Calories	Kilograms	Thousand Calories	Kilograms	Thousand Calories
Meat d/	1,980	41	81	41.5	82	39	77	42	83
Edible slaughter fats e/	7,800	4.7	37	4.8	37	4.5	35	4.9	38
Milk	600	260	156	270	162	240	144	280	168
Fish f/	500	15	7	15	7	15	7	15	7
Potatoes g/	700	120	84	120	84	120	84	120	84
Other vegetables	210	110	23	120	25	100	21	120	25
Sugar h/	3,483	40	139	42	146	36	125	42	146
Vegetable oil i/	8,840	10	88	10	88	8	71	10	88
Flour j/	3,300	150	495	145	479	160	546	140	471
Total k/			1,110		1,110		1,110		1,110

a. Unless otherwise indicated, data are calculated from production estimates in Tables 21, 22, 25, and 26 (pp. 75, 77, 82, and 84, respectively, above). The midyear population of the USSR in 1970 is estimated at 244.6 million.
b. Availability of food under the following three alternative situations: alternative A is with possible fertilizer usage and average weather; alternative B is with probable fertilizer usage and worse than average weather; and alternative C is with probable fertilizer usage and better than average weather.
c. Availability of food with probable fertilizer usage and average weather.
d. Production of meat less 13 percent slaughter fats.
e. Edible slaughter fats used for food are estimated to be 10 percent of production of meat.
f. Availability of fish for food is estimated by projecting the trend in past performance of the Soviet fishing industry.
g. Consumption of potatoes in 1970 is estimated at 120 kilograms per capita.
h. Sugar extraction rate of 14 percent applied to estimated procurements of sugar beets. The resulting estimates for production of sugar were adjusted for probable net stock changes and foreign trade.
i. Estimates based on the past relationship between production of sunflower seeds and production of vegetable oils. The resulting estimates were adjusted for probable net stock changes and foreign trade.
j. Residual. The total amounts of flour and grain (assuming an extraction rate of 80 percent) required in 1970 to provide the population with the estimated per capita availabilities of flour are as follows:

Estimated Per Capita Availabilities of Flour (Kilograms)	Requirements (Million Metric Tons)	
	Flour	Grain
140	34.2	43
145	35.5	44
150	36.7	46
160	39.1	49

k. The above foods are estimated to provide 95 percent of the total caloric intake. The total of 1.11 million calories per capita per year, if 95 percent of total caloric intake, provides a daily caloric intake per capita of 3,200 calories.

APPENDIX C

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